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NEW ZEALAND STATE FOREST SERVICE.

E. PHILLIPS TURNER, *Director of Forestry.*

THE

TREES OF NEW ZEALAND.

BY

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AND

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THE HON. O. J. HAWKEN,
Commissioner of State Forests.

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TO THE HONOURED MEMORY

OF

THOMAS KIRK,

THE AUTHOR OF THE CLASSICAL "FOREST FLORA OF NEW ZEALAND," AND FOR MORE THAN THREE DECADES THE LEADER OF BOTANICAL INQUIRY IN THE COLONY, THIS BOOK IS DEDICATED BY ITS AUTHORS.

PREFACE.

THIS book is designed, in the first place, to supply our distinguished visitors—the delegates to the Third British Empire Forestry Conference, 1928—with a brief account of New Zealand's indigenous forests, together with short descriptions of the trees (in a rather wide sense) which in part compose them, but excluding those peculiar to the distant outlying islands. In most cases a photograph accompanies a description, as an aid for the rapid identification of the tree.

In the second place, as there are many in this country anxious to ascertain for themselves the names of such trees as they encounter in their rambles, or grow in their gardens, and to learn something of their distribution and economic uses, we have had such inquirers constantly in mind while preparing the book, and we hope it will serve their laudable purpose. We also trust that it will come into the hands of many teachers of nature-study, and, above all, the senior pupils in schools, so that the latter may come to understand clearly what a priceless possession are these forests of theirs with the trees pure New-Zealanders, and that with such knowledge will arise a fixed determination that the areas of forest and other vegetation set aside as national parks, scenic reserves, and sanctuaries shall never be desecrated, but remain far into the distant future living examples of primeval New Zealand.

In addition to having received much help in the matter of specimens for photographing from various officers of the State Forest Service, we must call attention

to the fine photographs produced under the direction of Mr. W. Boardman, the Chief Draughtsman, by Mr. S. Gibson, a member of his staff, both of whom have taken the greatest pride in the work and to whom the most important feature of the book is due. Also we must record our most grateful thanks to the following, not members of the Service, who have supplied much valuable material: Mrs. M. M. M. Martin (Ngaio), Messrs. A. D. Beddie (Petone), P. Black (Palmerston North), O. Gidall (Ngaio), James Hunter (Auckland), George Simpson (Dunedin), and J. S. Thomson (Dunedin). Further, we are greatly indebted to Mr. W. R. B. Oliver, M.Sc. (Director of the Dominion Museum), for allowing us to use such herbarium material as we required. Finally, we must point out that in drawing up the descriptions of the species we have consulted the standard works of T. Kirk and T. F. Cheeseman; nevertheless, for all statements we alone are responsible.

L. C.
E. P. T.

State Forest Service,
Wellington, 7th September, 1928.

The Trees of New Zealand.

CHAPTER I.—THE FORESTS.

THE vegetation of primitive New Zealand from sea-level to an altitude ranging from about 3,000 ft. to 4,000 ft. consisted in large part of two great plant-formations—apparently altogether opposed in their climatic requirements — **forest** and **tussock - grassland ;** the former easily dominant in North Island, and the latter with its headquarters in South Island to the east of the backbone of the Southern Alps. The presence of either community depended primarily upon the average annual rainfall and number of rainy days ; but a soil little retentive of moisture, accompanied by frequent violent winds—sometimes extremely dry—was strongly hostile to rain-loving forest, but well tolerated by grassland, though by no means essential for its well-being. Many other plant-communities taken together occupied a wide area, but they were mostly regulated by soil-conditions.

European settlement, though it only commenced in earnest less than ninety years ago, has greatly altered the face of the land, and primitive New Zealand can now be seen only in those localities unsuited for agriculture, particularly the mountain areas with high rainfall, and in the numerous reserves which have been established for its protection ; but between the primitive and the entirely replaced vegetation there are modified communities of many grades, and most forests readily accessible are of a non-primitive character.

More than any other class of vegetation the original forest-covering has disappeared; so, when travelling in North Island by rail or motor, on both sides of the road

are to be seen splendid artificial meadows occupying land which a few years earlier was covered with dense forest. Such replacement of forest by grassland, on which the prosperity of the Dominion so largely depends, has been accomplished without the aid of the plough, the forest being felled, the fallen trees and shrubs burnt, and seeds of suitable pasture-plants sown by hand on the ashes before they were quite cold. Nevertheless, wide areas of forest primeval, or almost so, still flourish, some of great value as sources of timber, but far the larger part is possibly of greater value in its function as protection forest for conserving and regulating the water-supply and preventing erosion.

The New Zealand forest as a whole differs greatly from nearly all forests of the Temperate Zones, insomuch as it comes into the same class as that type of tropical lands known as **rain-forest.** Its chief claims for this rank are as follows: (1) The trees are nearly all evergreen and belong to many genera; (2) some species develop large buttresses—sometimes plank-like—at the base of the trunk; (3) flowers are produced by certain species on the naked stems, and in one species on the trunk itself (fig. 1); (4) nearly always roots extend far through the surface soil and frequently project above it; (5) woody, often thick-stemmed lianes belonging to several families and high-perched epiphytes (massive herbaceous plants, good-sized shrubs, young trees, large ferns and lycopods, and orchids) are physiognomic; (6) in many places tall tree-ferns abound (fig. 2), and herbaceous ferns of numerous species are everywhere; (7) the forest-floor, fallen logs, bases and trunks of trees, are covered with carpets or mantles of translucent filmy-ferns, mosses, and liverworts; (8) twigs of shrubs are frequently clothed with bryophytes, while great foliaceous lichens and long slender mosses depend from them, and even leaves themselves may accommodate bryophyte colonies; (9) there is a dense undergrowth of shrubs of various life-forms, young trees (frequently in form and shape of leaf distinct from the adult), and huge tussocks of sedges; (10) the forest is in several stories—perhaps six; (11) everywhere that complex of conditions induced by the forest itself is manifest in the life-forms—*e.g.*, shrubs which in the open would be rounded and symmetrical, or extremely dense, put forth long slender stems, and saplings have often much-reduced branches and long main stems, or they may mimic scrambling lianes. In short, the forest exhibits extreme luxuriance of growth, and Nature, as it were, runs riot.

FIG. 1.—Inflorescence and fruits of the kohekohe (*Dysoxylum spectabile*). [*Photo, S. Gibson.*

In one respect, and that one essential, the New Zealand forest differs from all others in that *it came into being and developed to its present composition and structure in the absence of grazing and browsing mammals.* This fundamental fact cannot be too highly stressed; while from the economic aspect, when the relation to forest of deer and the like is being considered, it must ever be remembered that such animals and forest were closely associated in all other parts of the earth for a long period of time, but that for New Zealand forest they are a new and increasingly destructive agent.

Taking the forests which clothe the lowlands and lower hills, their plant-population of seed-plants, ferns, and plants closely related to ferns numbers about 385 species, which belong to 65 families and 146 genera, the ferns, &c., numbering 95 and the seed-plants 290. The following are the largest—but not of necessity the most important—families and genera, to each of which its number of forest species is appended: Families—Ferns (*Filices*), 90; the coprosma family (*Rubiaceae*), 28; orchids (*Orchidaceae*), 23; the sedge family (*Cyperaceae*), 20; the podocarp (*Podocarpaceae*) and myrtle (*Myrtaceae*) families, each 16; the daisy family (*Compositae*), 15; and the lily (*Liliaceae*) and pitchy-seed (*Pittosporaceae*) families, each 10. Genera—*Coprosma*, 25; filmy-ferns (*Hymenophyllum*), 18; *Pittosporum* and ratas (*Metrosideros*), each 10; *Blechnum*, 9; *Uncinia*, 8; and *Trichomanes* and *Podocarpus*, each 7. When these *few* genera, several having less than twelve species, are considered, as compared with the remaining extremely small genera, the diversity of the forest is plainly manifest.

Notwithstanding the tropical character of the forest, how purely a New Zealand production it is may be seen from the fact that, leaving the ferns and their close relatives on one side, no less than 89 per cent. of the species are endemic; and if the ligneous plants be alone considered, all are pure New-Zealanders, except three—the mahoe (*Melicytus ramiflorus*—fig. 55), the akeake (*Dodonaea viscosa*), and the kawakawa (*Macropiper excelsum*). Then there are the following endemic genera which are confined to forest: *Tupeia* (one of the mistletoes), *Dactylanthus* (a root-parasite), *Ixerba* (fig. 45), *Carpodetus* (fig. 15), *Alectryon* (fig. 8), *Tetrapathaea* (a liane closely akin to the passion-flower), *Teucridium* *Rhabdothamnus*, *Alseuosmia*, and *Colensoa*; and probably *Hoheria* (lacebark) and *Brachyglottis* (rangiora) should be included.

Notwithstanding what is said in the last paragraph, many species and certain genera, endemic though they be, claim direct descent from tropical ancestors who came to what was then Great New Zealand during its extension far to the north in the early Tertiary. The kauri, the kiekie (*Freycinetia Banksii*), the nikau-palm (*Rhopalostylis sapida*), *Ascarina lucida* (fig. 10), the pigeonwood (*Hedycarya arborea*), the species of *Weinmannia*, the pittosporums, the ratas, and many other common forest species are descended from the tropical invaders.

Far more important for the species than their pedigrees are their **life-forms**, which in many cases are not of necessity identical with those which distinguish them when growing in the open—*e.g.*, a tree in the forest or even a liane may be a shrub in the open, or a dense rigid open cushion exposed to strong light and frequent gales be an erect twiggy shrub in the forest. Even in forest itself one and the same species may be of quite different habit according to circumstances. But, apart from such differences in relation to habitat, the following are the ordinary life-forms (using broad terms) of the class of forest under consideration, together with the number of species to each: Trees, 108; shrubs, 59; semi-woody plants, 5; herbaceous plants, 43; grass-like plants (only one true grass included), 24; lianes (excluding ferns), 26; epiphytes (excluding ferns), 17; parasites, 13; tree-ferns, 8; filmy-ferns, 25; herbaceous ferns, 57: but many of the last two classes are frequently epiphytes or lianes, or they may belong to both categories.

So far the New Zealand forest has been dealt with here as if it were uniform in composition and structure; but such is far from being the case. Indeed, the forest ranges from the purely tropical rain-forest as already described to one where more or less of the rain-forest characteristics are absent, and where, instead of diversity of tall trees, there is uniformity, while the trees themselves belong to a genus (*Nothofagus*) not of tropical but of subantarctic affinity. Between these two extremes come many intergrading links, yet, except in one exceptional class, but few notable rain-forest characteristics are absent. Thus, though the term "rain-forest" can be applied to *all* New Zealand forests, they naturally fall into the two distinct subdivisions, **subtropical rain-forest** and **subantarctic rain-forest,** the former, for short, to be designated **rain-forest proper,** and the latter **Nothofagus forest.** Between the two classes there are intermediates connecting one with the other; yet there are wide areas occupied by pure forests of each class.

Four major factors influence the composition of the forest communities. These are (1) latitudinal change, (2) altitudinal change, (3) proximity to the sea, and (4) increase of water in the soil. Minor factors, to cite a few, are aspect, nature of the soil, and topography.

As for latitudinal change, this must evidently be a powerful factor in a country extending through rather more than thirteen degrees of latitude (lat. 34° 15′ S. to 47° 30′ S.). But the outgoing of species in proceeding from north to south is not as gradual as might be expected, for there are three lines—lat. 36°, lat. 38°, lat. 42°—in the vicinity of which considerable bands of species halt ; nor do such barriers to advance present natural obstacles of any kind, while, on the other hand, the apparently formidable barriers of Cook Strait and Foveaux Strait are hardly barriers at all.

Leaving latitude 36° on one side, since the species halting there are comparatively few, the dropping-out of common forest-plants at about latitude 38° (some do not extend so far, but others go for a fair distance beyond) is so great that from somewhat south of that line there extends southwards forest of a different composition from that extending to the extreme north, or thereabouts, of North Island. The following list of characteristic forest species which halt at or about this line, though far from complete, gives a fair indication of what takes place : The mangemange (*Lygodium articulatum*), the toatoa (*Phyllocladus glaucus*—fig. 82), the kauri (*Agathis australis*—figs. 2A, 7), the toru (*Persoonia toru*—fig. 80), the taraire (*Beilschmiedia taraire*—fig. 12) (but as a *common* tree it had gone out much farther north), the mangeao (*Litsaea calicaris*—fig. 52), the houpara (*Pseudopanax Lessonii*), the tawari (*Ixerba brexioides*—fig. 45), the tawheowheo (*Quintinia serrata*—fig. 101), the towai (*Weinmannia sylvicola*—fig. 109), the white rata-vine (*Metrosideros albiflora*), the korokio (*Corokia buddleoides*) ; probably the pohutukawa (*Metrosideros tomentosa*—fig. 58) and the puriri (*Vitex lucens*—fig. 107) should be included, though they extend rather far to the south. The northern North Island forest in general is also distinguished from the southern North Island forest by the absence north of the Thames mountains of a number of species extremely common farther south, those of special physiognomic importance being the species of *Nothofagus* (excepting *N. truncata*, which extends sparingly northwards to near Kaitaia), the kamahi (*Weinmannia racemosa*—fig. 108), and the hupiro (*Coprosma foetidissima*).

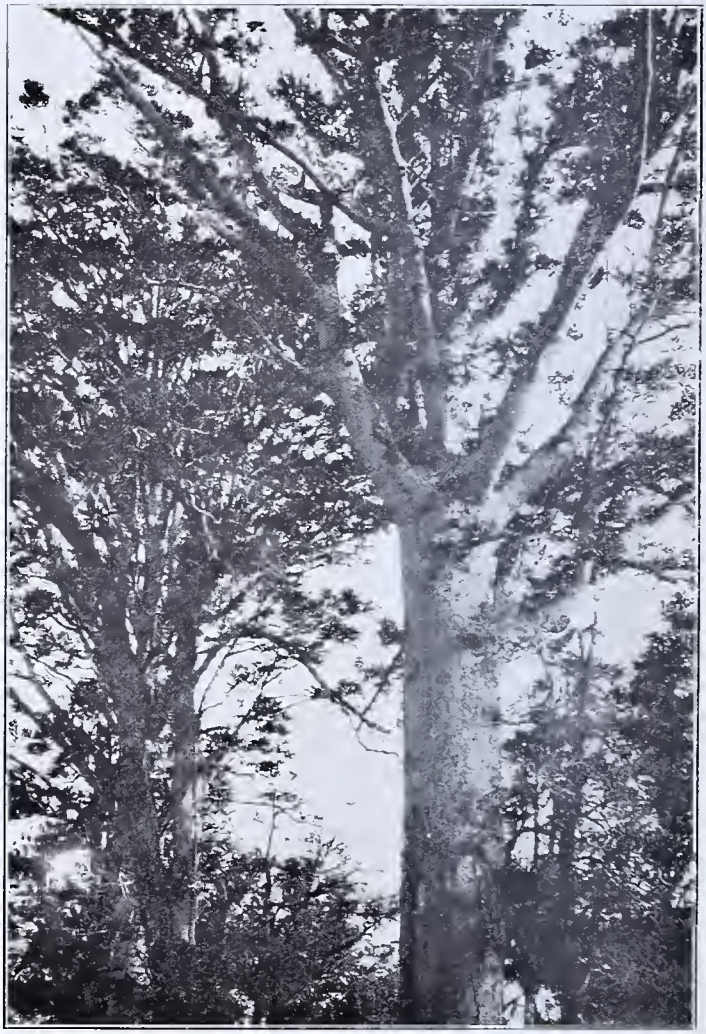

FIG. 2A.—Kauri-trees (*Agathis australis*) showing the upper part of the trunk and manner of branching.

[*Photo, C. M. Malfroy.*

To this southern North Island forest Cook Strait is no barrier, but it continues to Marlborough north of the River Wairau and through northern and western Nelson where soil-conditions permit, the northern species following the coast-line and mostly halting near latitude 42° or somewhat beyond, while on the east a few occur on Banks Peninsula.

Somewhat south of latitude 42° the true South Island forest begins, and it extends (but losing a few species on its way) to Stewart Island. That portion of the lowland forest on the Westland coastal plain is separated from the remaining South Island lowland forest south from latitude 42° by its strong North Island physiognomy, due to the abundance of an epiphytic asteliad (*Astelia Cunninghamii*) and the lianes, the kiekie (*Freycinetia Banksii*), *Metrosideros perforata*, and *M. scandens* (syn. *M. florida*). *Quintinia acutifolia* and *Ascarina lucida*—small trees absent in the eastern and southern South Island forest—are abundant. But far the most remarkable feature of the Westland forest is the absence of any species of *Nothofagus*, even on the mountains, from the south bank of the River Taramakau (a few trees come to this bank in its upper part) for about 100 miles southwards, though both to the north and south of these limits *Nothofagus fusca* and *N. Menziesii* are both gregarious and abundant.

More rapid in their influence than those comparatively slow alterations which latitude brings about are changes in altitude marked by decrease of temperature leading to frost and snow and increase of precipitation. Thus, in relation to the above as the primary factors inducing change in the composition of the forest, there are species confined to the lowland belt, others to the intermediate or montane belt, and others again to the highest forest belt, the subalpine, which terminates at the timber-line. Generally these belts are well marked, and the transition from one to the other quite sudden. Nowhere can this be more easily and better seen than on Mount Egmont. Latitude also plays a considerable part in altitudinal distribution of the species, and many, common at sea-level to the south of latitude 42° in South Island, are confined to the montane or subalpine belts in North Island—*e.g.*, plants of this class include the pepper-tree (*Wintera colorata*—fig. 111), the mountain-wineberry (*Aristotelia fruticosa*), the southern-rata (*Metrosideros lucida*—fig. 56), the haumakaroa (*Nothopanax simplex*—fig. 71), the mountain ivy-tree (*N. Colensoi*—fig. 69), the broadleaf (*Griselinia littoralis*—fig. 38), and the hupiro (*Coprosma*

foetidissima). Species from the adjacent subalpine-scrub, or from open communities above the timber-line, become members of subalpine forest ; but even with these additions its florula consists of only 175 species, as compared with 385 for that of the lowlands and lower hills. Not only is altitude reflected in comparative paucity of species, but in their reduction in stature, so that at the timber-line lofty trees may be transformed into dense shrubs, and shrubs usually erect may assume the prostrate form.

Proximity to the sea leads to a class of forest distinct from the ordinary lowland type in its composition, in the much lower stature of its members, and in the extreme density of the forest-roof, the last two characters induced by the frequent more or less salt-laden sea-winds. On the other hand, the mild maritime climate favours the presence of plants which will not tolerate frost, so that a number of well-known trees and shrubs are confined, or almost so, to coastal forest. The following are common members of this class : The kawakawa (*Macropiper excelsum*), *Paratrophis opaca* (fig. 78), the karo (*Pittosporum crassifolium*—fig. 85), *P. umbellatum*, the karaka (*Corynocarpus laevigata*—fig. 23), the akeake (*Dodonaea viscosa*—fig. 29), the pohutukawa (*Metrosideros tomentosa*—fig. 58), the taupata (*Coprosma retusa*—fig. 20), and the ngaio (*Myoporum laetum*—fig. 61). It has already been seen that three of the above do not extend much beyond latitude 38°, while the ngaio alone reaches the shore-line of Foveaux Strait.

With increase of water in the soil sufficient to bring about partial swamp-conditions all the year round, there is no longer a mixed assemblage of tall trees, but one alone—the kahikatea (*Podocarpus dacrydioides*—figs. 2B, 92)—becomes dominant, and a forest distinct in appearance from all others is established, thanks to the multitude of tall mast-like trunks standing closely side by side and the absurdly small heads considering the dimensions of the trees, and, if in North Island, the astonishing number of epiphytic asteliads on the branches, looking like gigantic birds' nests. In North Island, too, and north of South Island the pukatea (*Laurelia novae-zelandiae*—fig. 47) is a common lofty tree. Though semi-swamp forest is independent of the frequent rainy days demanded by rain-forest proper, its structure is that of rain-forest, but its florula is smaller.

The matter of classification of the great forest plant-formation of North Island, South Island, and Stewart Island can receive but little consideration here. It is a complicated

study, quite beyond the range of this little book, so that some general considerations on which classification depends are alone presented. It has already been explained that there are the two distinct primary divisions, **subtropical rain-forest** (rain-forest proper) and **subantarctic rain-forest**

FIG. 2B.—Two kahikatea trees (*Podocarpus dacrydioides*) left standing after the forest had been felled. Behind is dense *Metrosideros lucida* forest ; Otira Valley, Westland.

[*Photo, L. Cockayne.*

(*Nothofagus* forest), and that these fall into altitudinal groups. It has also been seen that there is **coastal forest** and **semi-swamp forest**, both closely allied to rain-forest proper.

An examination of any extensive area of rain-forest proper will usually show that no one tree or class of trees dominates all parts, and that in one part broad-leaved

dicotylous trees are in the ascendancy and in another podocarps, or north of latitude 38° it may be the kauri. Where the dicotylous trees rule, one of them will be dominant. Thus, north of latitude 36° it is frequently the taraire (*Beilschmiedia taraire*), and there is taraire forest, or perhaps more correctly a taraire association or subassociation, as the case may be. Farther south, extending to northern Marlborough, the dominant tall tree is frequently the tawa (*Beilschmiedia tawa*); but other dicotylous trees may rule, especially the northern-rata (*Metrosideros robusta*). Farther south again the commonest broad-leaved dicotylous tree association is that dominated by the kamahi (*Weinmannia racemosa*); and this community is common in Stewart Island. But in lowland forest these dicotylous trees do not have all their own way, nor control the forests entirely. On the contrary, many wide areas of forest are dominated by the kauri in the north or through the lowlands generally by one or other of the podocarps, especially the rimu (*Dacrydium cupressinum*), or podocarp and dicotylous tree may equally govern a forest area. In short, the combinations are many, the whole matter is greatly complicated, and it is far from easy to make a true classification, so an approximation to the truth is probably all that can be attempted. Generally, however, the popular names for the forests are a misnomer, since they are based upon the *value of a forest for timber*, and not upon *dominance, composition, and structure*. Thus, in so-called kauri forest, rimu forest, or totara forest, the tree after which the forest is designated is rarely dominant.

In the case of *Nothofagus* forest classification is far more simple, for no other tall tree than one or more of the beeches may play any part. All the same, there is mixed *Nothofagus* forest where the beeches and certain other forest-trees are equal in number. It is, however, chiefly in the montane and subalpine belts that *Nothofagus* forest rules, clothing the slopes for many miles at a time with a continuous dark mantle. In the lowland and montane belts of North Island and northern Marlborough–Nelson the species are the hard-beech (*Nothofagus truncata*), the black-beech (*N. Solandri*), and their hybrids. In the upper montane and lower subalpine belts the red-beech (*N. fusca*) is abundant, but usually accompanied by the silver-beech (*N. Menziesii*), which with increase of altitude becomes dominant and may extend to the timber-line, or as a shrub be a member of the subalpine-scrub. But the subalpine species *par excellence* is the moun-

tain-beech (*N. cliffortioides*), which in South Island forms for some hundreds of miles the uppermost belt of forest.

Nothofagus forest is not, however, the sole high-mountain forest. On some mountains, both of North Island and South Island, the beeches are absent, and the subalpine forest is dominated by the kaikawaka (*Libocedrus Bidwillii*—fig. 50) and thin-bark totara (*Podocarpus Hallii*), so that in some parts of the Southern Alps there is forest of the latter class on the west of the Divide and *Nothofagus* forest on the east. In places a low forest closely allied to subalpine-scrub forms the final belt above *Libocedrus-Podocarpus* forest, and consists of various species of daisy-trees (*Olearia*), shrubby groundsels (*Senecio*), the mountain-ribbonwood (*Hoheria glabrata*), the alpine toatoa (*Phyllocladus alpinus*), the mountain-neinei (*Dracophyllum Traversii*), the broadleaf (*Griselinia littoralis, Podocarpus Hallii*, and *Libocedrus Bidwillii*; but all these need not be associated in the same community.

Where water can accumulate in the high-mountain forest-area there will be bog-forest, which may be dominated by either beeches, small podocarps, or *Libocedrus*, the podocarps being the pink-pine (*Dacrydium biforme*), yellow silver-pine (*D. intermedium*), silver-pine (*D. Colensoi*) occasionally, mountain-pine (*D. Bidwillii*), alpine toatoa (*Phyllocladus alpinus*), alpine totara (*Podocarpus alpinus*), and, as a carpet, the pigmy pine (*Dacrydium laxifolium*).

Making, in imagination, a rapid descent to the coast-line, forest may be seen quite close to the shore where there is more or less shelter from the prevailing wind, though certain trees grow where exposed to frequent sea-spray—*e.g.*, *Dodonaea viscosa*, *Coprosma retusa*, and *Myoporum laetum*. The coastal forests range from those which are merely the ordinary rain-forest of the locality, its members modified in form by the coastal conditions, or it may consist of various combinations of true coastal trees mixed with certain trees of lowland forest. A common type of coastal forest, but differing latitudinally in composition, is dominated by the karaka (*Corynocarpus laevigata*). Another association—semi-coastal rather than coastal, and now almost eradicated by settlement—is dominated by the trunk-flowering kohekohe (*Dysoxylum spectabile*), with far-extending, horizontal, irregular branches.

However stable an area of forest may appear, there is really no true fixity, but generally fairly rapid change is in progress. To understand what is taking place a close study must be made of the life-history of the different types of forest—a

study by no means satisfactory, since the actual beginnings of certain forests are obscure and many necessary data have not yet been secured. But a good deal may be learnt by observing what is taking place within a forest and on its outskirts, and by examining plant-communities of various kinds which occur near forest, as also securing details of what happens on the areas where forest has been burnt or felled, or more or less damaged.

What follows is a brief summary of the present state of knowledge on this highly important question, *fundamental as it is both from the aspects of the scientific study of vegetation and the practical application of this study to forestry.*

(1) Leaving swamp-forest and bog-forest on one side, and dealing with the former under semi-swamp forest, the first stage in the development of forest seems frequently to be the incoming of light-demanding trees, shrubs, and other forest-plants into open shrubland, of which manuka (*Leptospermum scoparium*) shrubland is the outstanding example. At first the manuka plants are extremely close, but in course of time the greater part are suppressed and what remain are saplings with long naked stems and small heads, so that plenty of light reaches the floor of this incipient forest. Many important forest-trees become established in such manuka shrubland—*e.g.*, the kauri, the rimu, the totara, the rewarewa, the towai, all the beeches, the toro; and, of other forest species, the whauwhaupaku (*Nothopanax arboreum*), *Leucopogon fasciculatus*, several species of *Coprosma*, the silver tree-fern (*Cyathea dealbata*), various light-tolerating herbaceous ferns, *Lycopodium densum*, and *L. volubile*; but there are many others, and principles rather than details are concerned here. In course of time the invading species of trees overtop the manuka, which, being strongly light-demanding, is doomed, and the first stage in the life-history of forest is concluded.

Certainly there are other classes of shrubland which encourage the incoming and establishment of forest-plants. Also, provided destructive competition is absent, various light-demanding trees can form colonies in the open, especially the totara, as on stony river-beds, and the beeches in tussock-grassland. A particularly wet climate favours the establishment of trees, as the rimu in Stewart Island (fig. 3). Gullies, too, are favourable, especially on the shady side. Various trees grow quite well on rocks, where they function in forest-establishment by dropping seeds on the ground below. A solitary tree in a favourable position

may quite well become the starting-point of a forest; and forest once established can readily extend outwards from its margin, a circumstance easily observed. Finally, nothing can show more clearly the tremendous power of New Zealand forest to overcome other competing communities than the fact that, in order to prevent the artificial pasture made by

FIG. 3.—Where the forest has been cut down in Stewart Island there is reinstatement in bright light of rimu (*Dacrydium cupressinum*).

[*Photo, L. Cockayne.*

burning the forest returning first to shrubland and later to forest, it must be kept continuously grazed. Were all grazing and browsing animals removed from North Island, it is no idle prophecy to declare that in about one hundred years all the artificial grassland would be clothed with young forest.

(2) As the light within the young forest becomes weaker those plants which demand shade will join the community, and those—a fairly large band—which are indifferent to the amount of light (*i.e.*, within certain bounds) will increase in numbers, so that by degrees the various forest species will be established and each find its suitable growing-place—dry or wet—in fairly bright light or the most extreme shade.

(3) With the forest fairly developed, and filled with plants of various life-forms suited to more or less different requirements and of unequal rates of growth, competition

FIG. 4.—A dense growth of the crown-fern (*Blechnum discolor*) forbids the incoming of seedlings into forest.

[*Photo, L. Cockayne.*

between them will become fierce, some greatly extending their area of occupation, and others driven into spots inimical to the majority of forest species, where they can live secure. The two master factors which regulate the competition are light and moisture in the soil. The life-forms which give a special advantage to their possessors are those with such density of growth as to make the development of seedlings beneath them impossible. In this respect colonies of the crown-fern (*Blechnum discolor*) probably take the lead (fig. 4). On the other hand, many bryophytes and mat-forming herbs make excellent seed-beds, as do

fallen logs also, and in these places seedlings of all kinds flourish.

(4) By the time the forest has reached its full development the various stories of its undergrowth will be completed, and there will be more or less—sometimes a great many—young trees waiting to replace the old ones when age, gales, disease, or other causes bring them to the ground. Such young trees may be *shade-demanders* or *shade-tolerators* —it matters not which—and others *light-demanders* with stems quite slender but many years of age: the tawa (*Beilschmiedia tawa*) and taraire (*B. taraire*) belong to the former class, and the podocarps to the latter. In many forests of North Island the young tawas—so far as young trees go—dominate in the undergrowth, so that when the tall trees fall, either singly or many within a brief time, they are replaced by tawas. Thus a forest dominated by podocarps is frequently a potential tawa forest, or one where the kauri reigns must eventually give place to the taraire; and these tawa (fig. 5) or taraire forests are destined to remain such for long periods, since their undergrowth will consist largely of young tawa or taraire trees.

Much the same thing happens with a podocarp community in South Island; but there the replacing tree is the kamahi (*Weinmannia racemosa*), thanks to its securing sufficient light for its development by growing as an epiphyte on the stem of a tree-fern. The behaviour of the northern-rata is somewhat similar; but it commences its life as an epiphyte perched high on the branches of a rimu, but, as the water-supply fails, it puts forth roots which descend to the ground, root firmly therein, and finally strangle to death its host, the coalescing roots becoming a trunk. Thus rimu forest is transformed into northern-rata forest; but the northern-rata may eventually be killed by the weight of epiphytic asteliads breaking its branches and fungi entering the wood. In such a case tawa forest would eventually replace that of northern-rata. Bearing the above facts in mind, it seems evident that the podocarp or kauri colonies of New Zealand subtropical rain-forest are a remnant merely of ancient conifer forests which have been in process of gradual extinction by certain broad-leaved dicotylous trees —a process of extreme slowness.

With the beech forests it is different. In them the shade-demanding and shade-tolerating species of trees are of no moment, and such forests regenerate freely into forests of the same class.

FIG. 5.—View of a piece of tawa (*Beilschmiedia tawa*) forest—a climax association—on the Mamaku Plateau.

[*Photo, L. Cockayne*

Semi-swamp forest has a life-history distinct in many respects from that of rain-forest proper. To see its beginnings one must go to lowland swamp, home of raupo (*Typha angustifolia*) in its deepest part, and of New Zealand flax (*Phormium tenax*) where fairly shallow. As these plants and their companions decay, the swamp becomes sufficiently shallow to permit the incoming of shrubs and trees, including manuka, cabbage-tree (*Cordyline australis*), *Coprosma robusta*, *C. propinqua*, the hybrids between these two, and the twiggy *Olearia virgata*. When slightly drier the kahikatea (*Podocarpus dacrydioides*) comes in and the nucleus of semi-swamp forest is established. Unless there is a constant supply of water from a river overflowing its banks the forest-floor must become drier and drier, so that many rain-forest species will become established and semi-swamp forest, as such, cease to be. When semi-swamp forest is felled many of the shrubs remain behind, the water content of the soil increases, and there is a powerful invasion of *Cordyline australis*, the induced association being in its appearance quite primitive.

CHAPTER II.—THE TREES.

THE object of this chapter is to supply those interested—and there should be a good many—with the means of identifying the different New Zealand trees by the aid of photographs of characteristic specimens and descriptions of the species. Such descriptions, for the sake of brevity and precision, are given in technical language, but for those unacquainted with such a complete glossary is provided in the Appendix.

Between trees and tall shrubs it is impossible to draw the line, for under peculiar conditions many forest-trees, even those most massive in character, after passing the seedling stage, do not develop into trees but take on the form of shrubs, and, as such, both blossom freely and produce abundant fruit. On the other hand, there are shrubs which nearly always remain shrubs proper and show no tendency to develop trunks, yet under extraordinary conditions they become slender trees with distinct trunks and crowns of branches. Here we take a very wide view of what constitutes a tree, so that not only are the true trees our theme, but nearly all the shrubs which occur as trees, though this may be a comparatively rare occurrence.

In addition to the trees of which figures and descriptions are given in the following pages, there are several the leaves and inflorescences of which are too large for satisfactory figures to be made of the size adopted in this book, so descriptions alone must suffice. Then there are a number of shrubby *Compositae* which under special conditions may be considered trees, and a key for their rapid identification is given. Also, in order that no plant with a claim to be called a tree (though usually nothing of the kind) be omitted, brief descriptions of a few (mostly related to species already figured) are presented.

FIG. 6.—*Ackama rosaefolia* (Saxifragaceae).

MAKAMAKA.

A small, bushy tree, 15–40 ft. high, or a shrub, its branches, leaves, and inflorescence brownish-pubescent; *leaves* unequally pinnate, 3–10 in. long, with 3–10 pairs of oblong to elliptic-oblong leaflets, 1–3 in. long, sessile or almost so, acutely serrate, the upper larger than the lower; *flowers* in much-branched panicles, unisexual, minute, 5-petalled; *fruit* a very small, 2-celled, 2-valved capsule, $\frac{1}{8}$ in. long.

Distribution.—Northern Auckland in the lowlands to north of lat. 36°, usually on outskirts of forest or in shallow gullies.

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Fig. 7.—*Agathis australis* (Araucariaceae).

Kauri.

A lofty, massive tree, 100 ft. high, but sometimes far higher, with columnar trunk 3–10 ft. diam. or even more, spreading head of great branches, and deciduous, flaking, shiny-grey bark; *leaves* alternate or almost opposite, linear-oblong to obovate-oblong, $\frac{3}{4}$–$1\frac{1}{2}$ in. long, sessile, entire, glabrous, very thick; *flowers* monœcious, the male about 1 in. long, cylindric, the female ovoid; *fruit* a hard, ovoid or globose cone 2–3 in. diam., which falls to pieces when ripe, scattering the compressed, winged seeds.

Distribution.—In lowland forest, North Island, from the extreme north to near Maketu (Bay of Plenty) on east, and Kawhia on west.

Fig. 8.—*Alectryon excelsum* (Sapindaceae).

Titoki.

A medium-sized tree, 40–50 ft. high, with trunk about 16 in. diam., black bark and branchlets, leaves beneath, inflorescence, and capsules clothed with rusty pubescence; *leaves* alternate, unequally pinnate, 4–12 in. long, with 4–6 pairs of short-petioled leaflets, obliquely ovate-lanceolate, 2–4 in. long, usually entire, membranous; *flowers* small, hermaphrodite or unisexual in panicles, 4–12 in. long, the anthers conspicuous, dark red; *fruit* a coriaceous capsule $\frac{1}{3}$–$\frac{1}{2}$ in. long, which when open exposes a large globose jet-black seed embedded in a bright-scarlet fleshy cup.

Distribution.—In lowland forest from the extreme north of North Island to Banks Peninsula on east of South Island and to northern Westland on west.

Fig. 9.—*Aristotelia serrata*—syn. *A. racemosa* (Elaeocarpaceae).

Makomako, Wineberry.

A small tree, 12–30 ft. high, or shrub, with reddish bark when young but dark-grey with age, and branchlets, young leaves, and inflorescence pubescent; *leaves* opposite, long-petioled, ovate, 2–5 in. long, acuminate, deeply serrate, thin, often reddish beneath; *flowers* in many-flowered axillary panicles, diœcious, small, fragrant, rose-coloured; *fruit* a 3–4-celled, small black or red berry.

Distribution.—Throughout the three Islands, extending as a shrub into the subalpine belt. It appears in abundance after forest is felled, but is not common in virgin forest.

Fig. 10.—*Ascarina lucida* (Chloranthaceae).

Hutu.

A small, glabrous, bushy tree, 15–30 ft. high, with trunk about 12 in. diam, or tall shrub, the bark purplish-black; *leaves* opposite, linear-oblong to elliptic-oblong, 1–2 in. long, short-petioled, coarsely serrate, dark-green, glossy, often glaucous beneath; *flowers* in a laxly-branched spike, diœcious, minute, lacking calyx and corolla; *fruit* a 1-seeded, small fleshy drupe.

Distribution.—Common in lowland forest in west of South Island; elsewhere recorded only from a few localities in Auckland, Taranaki, Wellington, Marlborough, and Stewart Island (doubtful).

Fig. 11.—*Avicennia officinalis* (Verbenaceae).

Manawa, Mangrove.

A small tree, 25 ft. high, or shrub, with spreading branches, furrowed grey bark and erect breathing-roots which project out of the mud; *leaves* opposite, ovate to elliptic-oblong, 2–4 in. long, short-petioled, entire, dark-green with yellow midribs and veins, hoary beneath with dense pubescence, coriaceous; *flowers* in heads of 4–8 on axillary peduncles, small, the corolla 4-lobed, coriaceous, silky; *fruit* a large ovoid, coriaceous 1-seeded capsule.

Distribution.—On tidal mud-flats in North Island from the far north to Opotiki on east and Kawhia on west.

FIG 12.—*Beilschmiedia taraire* (Lauraceae).

TARAIRE.

A medium-sized tree, 50–70 ft. high, with straight, erect trunk 1–2½ ft. diam., smooth brown bark and branchlets, petioles, leaf-veins, and inflorescence-branches covered with red-brown, velvety tomentum; *leaves* alternate, short-petioled, obovate to broadly oblong, 3–6 in. long, obtuse, entire, glaucous beneath and veins pubescent; *flowers* in axillary panicles 1½–2½ in. long, inconspicuous, without petals; *fruit* a dark-purple, one-seeded, ovoid berry, 1½ in. long.

Distribution.—North Island, in lowland forests from the extreme north to about lat. 38°, but only common in the north.

FIG. 13.—*Beilschmiedia tawa* (Lauraceae).

TAWA.

A fairly tall tree, 40–80 ft. high, with trunk 1–3½ ft. diam., a smooth, blackish bark; *leaves* alternate, short-petioled, usual lanceolate or rather broader, 2–3½ in. long, acute, entire, glabrou yellowish-green above, glaucous beneath, thin; *flowers* in axilla panicles 1½–3 in. long, minute, greenish-yellow; *fruit* a dark-purpl ovoid, damson-like, one-seeded berry, 1 in. long.

Distribution.—In lowland and montane forests throughout Nor Island, and in South Island in northern Marlborough and t adjacent part of Nelson.

Fig. 14.—*Brachyglottis repanda* (Compositae).

Rangiora.

A small, bushy tree, 15–20 ft. high, or tall shrub, the branches lensely clothed with white tomentum; *leaves* alternate, long-petioled, broadly oblong to ovate-oblong, 4–12 in. long, irregularly obed or sinuate, dull-green above, milk-white tomentose beneath, hin; *flowers* in large panicles, the flower-heads small, numerous, ream-coloured, fragrant; *fruit* an achene with many pappus-hairs.

Distribution.—In the lowland and lower montane belts throughout North Island, extending in South Island to Greymouth on the west nd Kaikoura on the east.

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FIG. 15.—*Carpodetus serratus* (Saxifragaceae).

PUTAPUTAWETA.

A small tree, 12–30 ft. high, with the trunk rarely 12 in. dia or a tall shrub, with close head of spreading branches; *lea* alternate, short-petioled, ovate-oblong to elliptical, 1–2 in. lo sharply serrate, glabrous, yellowish-green above but dark-gre above the veins; *flowers* in many-flowered panicles, 1–1½ in. lo white, ⅕ in. diam., 5-6-petalled; *fruit* a small globose, 3–5-cel shining black capsule.

Distribution.—Common throughout the three Islands, ascend into the lower subalpine belt.

Fig. 16.—*Coprosma arborea* (Rubiaceae).

Mamangi.

A round-headed tree, 15–30 ft. high, with the trunk 6–18 in. diam., or a tall shrub; *leaves* opposite, short-petioled, ovate-spathulate or broader, 1–2½ in. long, obtuse, narrowed into winged petioles, entire, glabrous, brownish-green, with reticulating veins, hardly coriaceous; *flowers* crowded in many-flowered heads (in *Coprosma* the flowers are very small, but the males fairly conspicuous through the 5–6 stamens projecting from the funnel-shaped or campanulate corolla), diœcious; *fruit* a broadly oblong or almost globose, translucent drupe, ¼ in. diam., with 2 plano-convex stones.

Distribution.—In well-lit lowland forest from extreme north of North Island to nearly latitude 38°.

Fig. 17.—*Coprosma grandifolia* (Rubiaceae).

Raurekau.

A low, bushy tree, 12–20 ft. high, or tall shrub, with dark-coloured bark; *leaves* opposite, obovate- or elliptic-oblong, 3–6 in. long, with petioles 1 in. long or longer, entire, glabrous, dull-green; membranous; *flowers* in fascicles at end of trichotomously-divided peduncles, 1–3 in. long, diœcious, the male flowers closer together than the females; *fruit* a reddish-orange, oblong, obtuse drupe, about $\frac{1}{3}$ in. long, containing 2 plano-convex stones.

Distribution.—Throughout lowland and lower-montane forests in North Island, extending to the north of South Island and to near Greymouth on the west and Kaikoura or perhaps farther south on the east.

FIG. 18.—*Coprosma linariifolia* (Rubiaceae).

YELLOW-WOOD.

A bushy tree, 12–25 ft. high, or tall shrub, with slender branches nd dark-grey bark; *leaves* opposite, short-petioled, linear to linear-anceolate, ½–1½ in. long, entire, glabrous, flat, dark-green; *flowers* erminating leafy branchlets, diœcious, the males in 2–5-flowered ascicles, the females solitary; *fruit* a broadly-oblong, black drupe, bout ⅓ in. long, containing 2 plano-convex stones

Distribution.—In lowland and montane forests from the Thames Valley in North Island to the south of South Island.

Fig. 19.—*Coprosma lucida* (Rubiaceae).

Karamu.

A glabrous, low, bushy tree, 12–20 ft. high, but oftener a tall shrub, with slender branches and dark-brown bark; *leaves* opposite, short-petioled, obovate to obovate-lanceolate, 2–3½ in. long, entire, glabrous, glossy, coriaceous; *flowers* numerous, in fascicles terminating trichotomously-divided peduncles, 1–2 in. long, diœcious; *fruit* a reddish-orange oblong or oblong-obovoid drupe, ⅓–½ in. long.

Distribution.—In lowland and montane forests throughout the three Islands.

FIG. 20.—*Coprosma retusa*—syn. *C. Baueri* (Rubiaceae).

TAUPATA.

A small tree, attaining in sheltered situations a height of 25 ft. more, or of many forms (even far-spreading and prostrate) in harony with the environment; *leaves* opposite, short-petioled, broadly ate or oblong, 1–3 in. long, obtuse, entire, glabrous, thick or fleshy, ight-green, extremely glossy; *flowers* diœcious, the males in dense eads on short axillary peduncles, the females in 3-6-flowered heads shorter peduncles; *fruit* an orange-yellow, ovoid drupe, $\frac{1}{3}$–$\frac{1}{4}$ in. long.

Distribution.—In coastal forest, and as a shrub on rocks, gravel ores, and in coastal scrub throughout the coast of North Island, d in South Island to Greymouth on the west, but on the east not yond the Marlborough Sounds and adjacent parts of Nelson.

FIG. 21.—*Coprosma robusta* (Rubiaceae).

KARAMU.

A glabrous, low tree, 12–20 ft. high, but oftener a tall shrub, the bark greyish-brown; *leaves* opposite, short-petioled, elliptic-lanceolate to elliptic-oblong, $1\frac{1}{2}$–3 in. long, usually acute, entire, shining-green; *flowers* in dense, many-flowered glomerules on short peduncles, diœcious, the female flowers much smaller than the males; *fruit* an oblong to ovoid reddish-orange drupe, $\frac{1}{4}$–$\frac{1}{3}$ in. long.

Distribution.—In lowland and lower-montane forests and their outskirts throughout North Island and South Island.

Fig. 22.—*Coriaria arborea* (Coriariaceae).

Tupakahi, Tree-tutu.

A rather straggling tree, 15–30 ft. high, or a tall or even small rub, with 4-angled branches and pale bark; *leaves* opposite, ovate oblong-ovate, 1–3 in. long, acute, sessile or almost so, entire, abrous, 3–5-nerved, rounded or cordate at base—the leafy stem sily mistaken for a pinnate leaf; *flowers* in drooping, many-owered racemes, 6 in. or more long, small, reddish, 5-petalled, the tals after flowering enlarging, becoming fleshy and embracing the uit; *fruit* globose, purplish-black, fleshy, extremely juicy.

Distribution.—On the margin of lowland and montane forests id scrubs, and on rocks, throughout the three Islands.

Fig. 23.—*Corynocarpus laevigata* (Corynocarpaceae).

Karaka.

A medium-sized, round-headed tree, 30–50 ft. or more high, its trunk 1–2 ft. diam.; *leaves* alternate, short-petioled, elliptic-oblong or oblong-obovate, 3–8 in. long, entire, glabrous, glossy dark-green coriaceous; *flowers* in erect, much-branched panicles, 4–8 in. long, small minute, greenish, the calyx 5-lobed and petals 5; *fruit* a large showy, orange, fleshy drupe, 1–1½ in. long.

Distribution.—In coastal forest throughout North Island, and in South Island extending to Banks Peninsula on the east and to south of Westport on the west.

Fig. 24.—*Dacrydium biforme* (Podocarpaceae).

Pink-pine.

A small tree, 15–40 ft. high, or a shrub, with the juvenile leaves distinct from the adult; *leaves* (juvenile) linear, $\frac{1}{2}$–$\frac{3}{4}$ in. long, spreading, very short-petioled, (adult) scale-like, triangular or rhomboid-triangular, $\frac{1}{20}$–$\frac{1}{12}$ in. long, closely appressed to the stem. *flowers* situated at tips of branchlets, diœcious, very small, the male $\frac{1}{8}$ in. long, solitary, the female occasionally in pairs; *fruit* an oblong nut, $\frac{1}{10}$ in. long.

Distribution.—In subalpine forest and scrub from Tongariro and the Ruahine Mountains in North Island southwards to South Island, but chiefly on the west, and Stewart Island, descending to sea-level in the south of South Island and Stewart Island.

FIG. 25.—*Dacrydium Colensoi* (Podocarpaceae).

SILVER-PINE.

A small tree, 20–40 ft. high, of conical form, with slender, often flexuous, adult branchlets somewhat resembling whipcord and a persistent juvenile form with leaves distinct from the adult; *leaves* (juvenile) narrow linear-subulate, $\frac{1}{4}$–$\frac{1}{2}$ in. long, lax, spreading (intermediate), lanceolate or narrow-triangular, $\frac{1}{8}$–$\frac{1}{6}$ in. long, falcate, flat, spreading in one plane, (adult) small, scale-like, rhomboid, $\frac{1}{20}$–$\frac{1}{12}$ in. long, imbricate, appressed to the stem; *flowers* terminal, diœcious, the males solitary, the females, 1–2; *fruit* a black, shining nut about $\frac{1}{12}$ in. long.

Distribution.—In lowland forest in North Island from near Kaitaia to Whangarei and Great Barrier Island, and in montane forest on the volcanic plateau, and in South Island both lowland and montane on the west possibly as far as Martin's Bay, but southern distribution not yet known.

FIG. 26.—*Dacrydium cupressinum* (Podocarpaceae).

RIMU.

A tall, massive tree, 60–110 ft. high or more, 2–5 ft. diam., with a small head, drooping ultimate branchlets, and dark-brown, scaling bark; *leaves* linear, $\frac{1}{12}$–$\frac{1}{8}$ in. long, trigonous, acute, keeled, somewhat appressed; *flowers* at tips of branchlets, diœcious, the males solitary or rarely 2 together, the females solitary; *fruit* an ovoid nut about $\frac{1}{8}$ in. long, seated on a red, fleshy receptacle.

Distribution.—In lowland and montane forests throughout the three Islands, ascending to the subalpine-scrub in parts of Stewart Island.

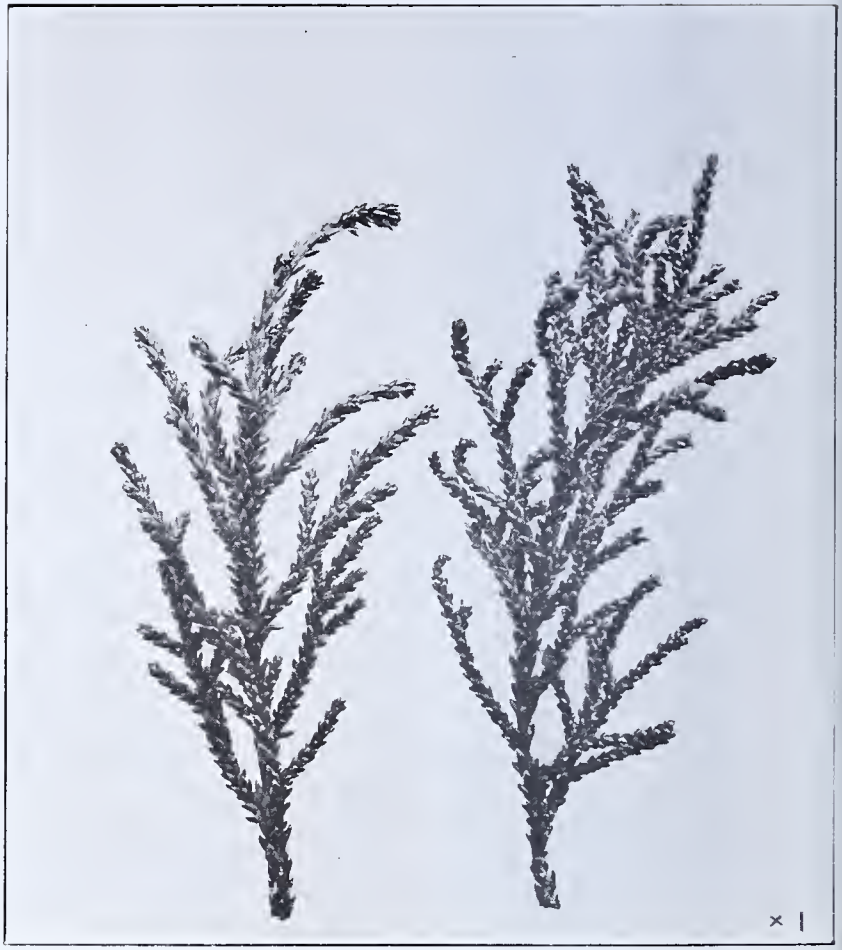

Fig. 27.—*Dacrydium intermedium* (Podocarpaceae).

Yellow Silver-pine.

A small tree, 20–40 ft. high or more, with the trunk 1–2 ft. diam., and a long persisting juvenile form which sometimes flowers and bears abundant fruit; *leaves* (early) narrow linear-subulate, $\frac{1}{3}$–$\frac{1}{5}$ in. long, spreading, curved, terete (intermediate), broad-subulute, $\frac{1}{8}$–$\frac{1}{4}$ in, long, trigonous, (adult) ovate-triangular to rhomboid, $\frac{1}{15}$–$\frac{1}{10}$ in. long. obtuse, keeled, imbricate, appressed; *flowers* terminal, diœcious (occasionally monœcious), solitary; *fruit* an oblong nut, $\frac{1}{8}$–$\frac{1}{6}$ in. long.

Distribution.—In North Island in forests between Bay of Islands and Whangarei, Great Barrier Island, the Thames mountains and subalpine on the volcanic plateau and the Ruahine-Tararua Range, and in South Island and Stewart Island on the west of both Islands, in the latter being the dominant tree of boggy forest.

Fig. 28.—*Dacrydium Kirkii* (Podocarpaceae).

Monoao.

A tall tree, 50–80 ft. high, with trunk 2–3 ft. diam., greyish-brown bark, and a long-persisting juvenile form; *leaves* (juvenile) linear, 1–1½ in. long, subacute, flat, (adult) ovate-rhomboid, $\frac{1}{12}$–$\frac{1}{8}$ in. long, obtuse, thick, imbricating, appressed; *flowers* diœcious, the male solitary, the female, usually 3–4, forming a short, oblong head, ¼–½ in. long; *fruit* an oblong, obtuse nut, about ⅛ in. long.

Distribution.—In lowland forest, North Island, from Hokianga to near Manakau Harbour, but never common.

FIG. 29.—*Dodonaea viscosa* (Sapindaceae).

AKEAKE.

A small tree, 15–30 ft. high, its trunk about 12 in. diam., and bark flaking, reddish-brown, or a shrub which may be prostrate; *leaves* alternate, short-petioled, narrow-linear-obovate or oblanceolate, 1–3 in. long, entire, glabrous, membranous; *flowers* in few-flowered terminal panicles, diœcious, small, the sepals 4, petals 0; *fruit* a compressed broadly 2–3-winged, orbicular capsule, $\frac{3}{4}$ in. diam.

Distribution.—In coastal forest and on stony shores from the extreme north of North Island, extending inland occasionally, to Banks Peninsula on the east of South Island and near Greymouth on the west.

FIG. 30.—*Dracophyllum longifolium* (Epacridaceae).

INAKA.

A small tree, 12–30 ft. high, or shrub, the branches slender, naked below but with bunches of erect leaves above ; *leaves* alternate, crowded, linear-subulate, 4–10 in. long, with a sheathing base $\frac{1}{3}$–$\frac{2}{3}$ in. long, the lamina concave, rigid, tapering to a fine point, minutely serrulate, glabrous ; *flowers* in 6–15-flowered racemes, $1\frac{1}{2}$–$2\frac{1}{2}$ in. long, the corolla bell-shaped, white, $\frac{1}{4}$–$\frac{1}{3}$ in. long ; *fruit* a capsule, $\frac{1}{6}$ in. diam., enclosed with the persistent sepals.

Distribution.—In North Island in the subalpine belt from the East Cape mountains southwards to the Tararua Mountains, and throughout the mountains of South Island, descending to the lowlands in the south and in Stewart Island.

Fig. 31.—*Dysoxylum spectabile* (Meliaceae).

Kohekohe.

A medium-sized tree, 25–50 ft. high, with trunk 1–3 ft. diam.; *leaves* very large, alternate, long-petioled, unequally pinnate, 9–18 in. long, with 3–4 pairs of leaflets, which are obovate-oblong or oblong-obovate, 3–7 in. long, undulate, glabrous, deep-green, glossy, strongly veined, smooth; *flowers* in pendulous panicles (fig. 1), 6–18 in. long, given off from the trunk and thick branches, the 5 petals waxy-white, linear, recurved; *fruit* a large, broad, 3–4-celled, ovoid capsule 1 in. long (fig. 1).

Distribution.—In coastal and semi-coastal forest throughout North Island, extending inland in some localities, and near the Marlborough Sounds and adjacent parts of South Island.

FIG. 32.—*Edwardsia microphylla*—syn. *Sophora microphylla* (Leguminosae).

KOWHAI.

A small tree, 20–30 ft. high, with trunk 1–2 ft. diam., its juvenile form long-persisting and made up of much-interlacing, wiry twigs and leaves smaller than those of the adult; *leaves* deciduous, alternate, short-petioled, unequally pinnate, with 23–35 pairs of leaflets or more, which are oblong to obovate, ¼–½ in. long, entire, glabrous (silky when young); *flowers* in 4–6-flowered racemes 1–1½ in. long, large, bright-yellow; *fruit* a jointed, 4-winged, indehiscent pod, 3–8 in. long, containing large yellow seeds.

Distribution.—Perhaps throughout North Island and South Island in open forest and alluvial valleys, but has been confused with *E. chathamica* (common in Auckland), from which it differs in its long-persisting juvenile form.

FIG. 33.—*Elaeocarpus dentatus* (Elaeocarpaceae).

HINAU.

A medium-sized tree, 40–60 ft. high, its trunk 1–3 ft. diam., the branchlets naked below, and the bark grey; *leaves* alternate, linear-oblong, lanceolate, and obovate-oblong, the petioles ½–1 in. long and blade 2–4 in. long, the margins recurved, obscurely sinuate-serrate, white beneath with silky down; *flowers* in 8–12-flowered silky racemes, white, ⅓–½ in. diam., their petals irregularly cleft; *fruit* a purplish, oblong drupe, about ½ in. long.

Distribution.—In lowland forests throughout North Island and almost to Foveaux Strait in South Island.

Fig. 34.—*Elaeocarpus Hookerianus* (Elaeocarpaceae).

Pokaka.

A small tree, 20–40 ft. high, with the trunk 1–2 ft. diam., and having a long-persisting juvenile form with much-interlaced, wiry branches and small leaves ranging from orbicular to deeply-cut narrow-linear; *leaves* alternate, short-petioled, linear-oblong, 1½–3 in. long, flat, sinuate-crenate or serrate, glabrous; *flowers* in short racemes, small, greenish-white, drooping, their petals irregularly cleft; *fruit* as for *E. dentatus* but smaller, ⅓ in. long.

Distribution.—Forests at all altitudes (the juvenile characteristic of Westland lowland forest) in all three Islands, but rare in northern Auckland.

FIG. 35.—*Entelea arborescens* (Tiliaceae).

WHAU.

A small tree, 15–20 ft. high, or a tall shrub, the young branches, leaves, and inflorescence covered with soft stellate hairs; *leaves* alternate, large, obliquely rounded-ovate, the petiole 4–8 in. long and the blade 4–9 in. long, cordate at base, irregularly doubly crenate-serrate; *flowers* in terminal or axillary cymes, abundant, white, 1 in. diam., 4–5-petalled; *fruit* a globose capsule, 1 in. diam., covered with long, rigid bristles.

Distribution.—Along coast of North Island southwards to Raglan and Tairua, but local farther south, extending to north of Marlborough and Nelson in South Island

Fig. 36.—*Eugenia maire* (Myrtaceae).

Maire-tawake.

A small tree, 15–50 ft. (occasionally) high, with trunk 1–2 ft. diam. and smooth white bark; *leaves* opposite, short-petioled, oblong-lanceolate or broader, 1–2 in. long, entire, membranous; *flowers* in terminal, many-flowered, short, flat-topped panicles, 1½–3 in. broad, the flowers ½ in. diam., white, myrtle-like, with many stamens ½–⅔ in. long; *fruit* a large, 1-seeded, pulpy, red berry, ½ in. diam., with a circular hollow at its apex, margined by the remains of the calyx.

Distribution.—In open lowland semi-swamp forest throughout North Island, extending to the Marlborough Sounds neighbourhood in South Island.

Fig. 37.—*Fuchsia excorticata* (Onagraceae).

Kotukutuku, Tree-fuchsia.

A small tree, 15–45 ft. high, with an irregular short trunk covered with flaking, papery brown bark; *leaves* in most localities deciduous, alternate, short-petioled, lanceolate to ovate-lanceolate, 2–5 in. long, entire or remotely obscurely serrate, glabrous, soft, silvery beneath; *flowers* axillary, solitary, $\frac{3}{4}$–$1\frac{1}{4}$ in. long, pendulous, bright-green blotched purple, fading to red; *fruit* a juicy, purplish-black, many-seeded, oblong berry about 1 in. long.

Distribution.—In well-lit forests at all altitudes throughout the three Islands.

Fig. 38.—*Griselinia littoralis* (Cornaceae).

Papaumu, Broadleaf.

A small tree, 30–50 ft. high, or a shrub, with short irregular trunk 2–5 ft. diam., and rough, furrowed, light-brown bark; *leaves* alternate, the petiole ½–1 in. long, ovate to ovate-oblong, 1–4 in. long, entire, glabrous, thick, yellowish-green; *flowers* in axillary panicles, 1–3 in. long or sometimes reduced to a raceme, diœcious, 5-petalled, minute; *fruit* a 1-seeded, black, oblong berry about ¼ in. long.

Distribution.—In North Island in montane and subalpine forest from Mount Tutamoe (northern Auckland) southwards throughout South Island and Stewart Island, extending upwards beyond the timber-line.

Fig. 39.—*Hedycarya arborea*—syn. *H. dentata* (Monimiaceae).

Porokaiwhiri, Pigeonwood.

A small tree, 15–40 ft. high, or a tall shrub, with trunk 1–1½ ft. diam., and dark-brown bark; *leaves* opposite, short-petioled, linear-oblong to obovate-oblong, 2–5 in. long, distantly serrate, usually glabrous, but may be more or less pubescent on midribs and veins; *flowers* in short axillary panicles, diœcious, small, male perianth saucer-shaped, ⅓–½ in. diam., pubescent; *fruit* a bright-red drupe, ½ in. long.

Distribution.—In lowland forests from the Three Kings Islands southwards, extending in South Island to Banks Peninsula on the east and to Preservation Inlet on the west.

Fig. 40.—*Hoheria angustifolia* (Malvaceae).

Narrow-leaved Lacebark.

A small, slender tree, 15-30 ft. high, with tough brown bark, which can be peeled off in long strips, and a long-persisting juvenile form with entangled branches and small, deeply-cut leaves; *leaves* alternate, short-petioled, linear-oblong, 3-4 in. long, sharply spinulose-serrate, glabrous except when young, thin; *flowers* in 2-4-flowered fascicles, showy, white, ⅓ in. diam.; *fruit* consists of five 1-seeded, indehiscent carpels radiating from a central axis, each furnished at the back with a broad, radiating wing.

Distribution.—In well-lit lowland or semi-swamp forest from Wairoa North (Hawke's Bay) in North Island southwards to the south of South Island.

FIG. 41.—*Hoheria glabrata*—syn. *Gaya Lyallii* (Malvaceae).

MOUNTAIN-RIBBONWOOD.

A small, deciduous tree with bark as for other species of genus, showy cherry-like blossoms, and branchlets, young leaves, and calyces clothed with short, soft, stellate hairs; *leaves* alternate, long-petioled, ovate-cordate, the blades 2–5 in. long, strongly acuminate, crenate, slightly hairy beneath, bright-green; *flowers* in 2–4-flowered fascicles, ¾–1 in. diam., 5-petalled; *fruit* a wingless, 2-valved, 1-seeded capsule.

Distribution.—At all altitudes in forest in wettest parts of South Island, ascending to above the timber-line.

Fig. 42.—*Hoheria Lyallii*—syn. *Gaya ribifolia* (Malvaceae).

Hoary Mountain-ribbonwood.

A small, deciduous tree similar to *H. glabrata*, but rather smaller, and hoary with stellate pubescence on young leaves, petioles, and inflorescences; *leaves* smaller than in *H. glabrata*, broadly ovate, incised or more or less deeply lobed, not acuminate, and the green masked by the hoary stellate hairs; *flowers* and *fruit* as in *H. glabrata*, but the latter slightly winged.

Distribution.—In the montane belt of the comparatively dry mountain areas to the east of the Divide in South Island, on the margin of forest and making groves on river-terrace.

FIG. 43.—*Hoheria populnea* (Malvaceae).

HOUHERE.

A small tree, 15–35 ft. high, lacking a persistent juvenile form; *leaves* alternate, long-petioled, broadly ovate, $2\frac{1}{2}$–4 in. long, coarsely serrate, glabrous, coriaceous; *flowers* in 4–10-flowered fascicles, $\frac{3}{4}$–1 in. diam., white; *fruit* as for *H. angustifolia*, but larger.

Distribution.—In low forest with abundant light, or in the open, from the extreme north of North Island to about latitude 38°.

Fig. 44.—*Hoheria sexstylosa* (Malvaceae).

Long-leaved Lacebark.

A small tree, 15–25 ft. high, of rapid growth, its juvenile form distinct from the adult in its drooping twigs and mostly deeply-cut, small leaves of many shapes; it flowers rather earlier than *H. populnea* and later than *H. angustifolia*; *leaves* (adult) lanceolate to broad-lanceolate, 2–5 in. long (usually much larger than in fig. 44), deeply serrate, glabrous; *flowers* in 2–5-flowered fascicles, very numerous, white; *fruits* as for *H. populnea*.

Distribution.—More than one distinct variety is included under the name, but, taking the species in a wide sense, it extends from about lat. 36° to the south of South Island. A variety (the type) with very long leaves is abundant in Hawke's Bay, Wellington, and Taranaki.

Fig. 45.—*Ixerba brexioides* (Saxifragaceae).

Tawari.

A small tree, 20–50 ft. high, with a trunk 1–2 ft. diam., and leaves opposite, alternate, and whorled; *leaves* short-petioled, linear-lanceolate or broader, 3–4 in. long (juvenile much longer), serrate glabrous, coriaceous, dark-green; *flowers* in terminal panicles, 1½–1 in. long, 5-petalled, 1–1½ in. diam., white, very showy; *fruit* a coriaceous, 5-celled capsule.

Distribution.—In montane forests, in fairly dim light, from near Hokianga to somewhat south of lat. 38°; frequently a companion plant of *Quintinia serrata* (fig. 101).

Fig. 46.—*Knightia excelsa* (Proteaceae).

Rewarewa, Honeysuckle.

A tall tree, 60–90 ft. high or more, with the habit of a Lombardy poplar, the trunk, 2–3 ft. diam., and the branchlets and young leaves beneath densely clothed with reddish-brown, velvety tomentum; *leaves* alternate, long-petioled, linear-oblong to obovate-oblong, usually broader than in fig. 46, 4–6 in. long (juvenile narrower, longer, and thinner), coarsely dentate, glabrous, hard; *flowers* in lateral racemes, 2–4 in. long, the flowers crowded, each flower with the red perianth-segments coiled spirally and the style, club-shaped above, protruding; *fruit* a coriaceous, pubescent follicle which splits into 2 boat-shaped valves.

Distribution.—In lowland forests, often on very steep slopes, where it is gregarious, throughout North Island, extending to the neighbourhood of the Marlborough Sounds, South Island.

Fig. 47.—*Laurelia novae-zelandiae* (Monimiaceae).

Pukatea.

A tall tree, from 80–100 ft. high or more, with trunk, 3–5 ft. diam., furnished at the base with large, radiating plank-buttresses and the branchlets tetragonous; *leaves* opposite, short-petioled, oblong to broadly oblong, $1\frac{1}{2}$–3 in. long, obtuse, bluntly serrate, glabrous, glossy dark-green, aromatic when bruised; *flowers* in axillary racemes, $\frac{1}{2}$–1 in. long, diœcious, very small; *fruit* (fruiting perianth) urceolate, 4-valved, 1 in. long, enclosing 6–12 hairy achenes (these the true fruits).

Distribution.—In lowland semi-swamp forest throughout North Island (but at times in dry stations), extending to northern Marlborough and western Nelson in South Island.

FIG. 48.—*Leptospermum ericoides* (Myrtaceae).

WHITE TEA-TREE.

A small tree, 15–50 ft. high and 1–2 ft. diam., or a tall shrub t times prostrate), the bark loose and stringy; *leaves* alternate in fascicles, narrow-linear, $\frac{1}{6}$–$\frac{1}{2}$ in. long, entire, glabrous or slightly ky, not pungent; *flowers*, $\frac{1}{8}$–$\frac{1}{4}$ in. diam., very abundant, smaller than *L. scoparium*, stalked, white, the calyx-lobes persistent; *fruit* a all capsule, completely sunk in the calyx-tube.

Distribution.—In open lowland or montane forest or shrubland roughout North Island and South Island.

FIG. 49.—*Leptospermum scoparium* (Myrtaceae).

MANUKA, RED TEA-TREE.

Occasionally a tree, 15–25 ft. high, with trunk up to 12 in. diam., the bark brown, thin, and hanging in strips, but usually a shrub, tall to prostrate; *leaves* alternate, sessile, linear to ovate, $\frac{1}{6}$–$\frac{1}{2}$ in. long, sharp-pointed, entire, glabrous; *flowers* solitary, sessile, axillary or terminal, $\frac{1}{4}$–$\frac{1}{2}$ in. diam. or broader, white, calyx-lobes deciduous; *fruit* a woody, persistent capsule, half-sunk in the calyx-tube.

Distribution.—From the lowlands to above the timber-line throughout all three Islands, usually in shrubland.

Fig. 50.—*Libocedrus Bidwillii* (Cupressaceae).

Kaikawaka, Mountain-cedar.

A small, pyramidal tree, 12–50 ft. high, with loose, light-brown, flaking bark and distichous branchlets, the juvenile shoots flattened and compressed, with acute leaves about $\frac{1}{8}$ in. long on the flanks and an upper and under row of minute appressed triangular leaves; *leaves* (adult) minute, triangular, $\frac{1}{15}$–$\frac{1}{12}$ in. diam., closely appressed, the branchlets being tetragonous; *flowers* monœcious or diœcious, the male a catkin, $\frac{1}{10}$ in. long, with 7–9 pendulous anthers; *fruit* a small, woody, 2-seeded, ovoid cone, $\frac{1}{4}$–$\frac{1}{3}$ in. long, of 4 spreading scales, each with a projecting spine at the back.

Distribution.—In North Island in montane and subalpine forests from Mount Te Aroha southwards, and in South Island at all altitudes, but lowland only in localities of very high rainfall.

FIG. 51.—*Libocedrus plumosa*—syn. *L. Doniana* (Cupressaceae).

KAWAKA.

A taller tree than *L. Bidwillii*, reaching 70 ft. high or more, but otherwise similar in most particulars, and differing chiefly in the broader juvenile shoots, whence the specific name *plumosa* (feathery), in the adult shoots being more or less compressed and not obviously tetragonous, and in the larger cones, 1 in. long.

Distribution.—Lowland forests in North Island from Mangonui to somewhat south of lat. 38°, and in the north-western corner of South Island.

Fig. 52.—*Litsaea calicaris* (Lauraceae).

Mangeao.

A small tree, 30–40 ft. high, with a trunk 1–2½ ft. diam.; *leaves* alternate, somewhat long-petioled, ovate to ovate-oblong, 2–5 in. long, entire, glabrous, membranous, reddish- or yellowish-green when young, somewhat glaucous beneath; *flowers* in 4–5-flowered umbels on short axillary racemes, diœcious, the perianth-segments 5–8, cream-coloured; *fruit* a 1-seeded, oblong-ovoid berry, ¾ in. long.

Distribution.—In lowland forests north of North Island to about lat. 38°.

FIG. 53.—*Macropiper excelsum*—syn. *Piper excelsum* (Piperaceae).

KAWAKAWA.

A low tree, 12–20 ft. high, or shrub, unlike any other New Zealand tree or shrub, frequently with but little trunk, and close-growing, slender, straight, smooth, flexuose, jointed stems marked with scars and swollen at the nodes; *leaves* long-petioled, orbicular-cordate or broadly ovate, generally cordate at the base, 2–4 in. long, entire, glabrous, dull-green, aromatic; *flowers* in solitary or binate unisexual spikes, 1–3 in. long, minute, densely packed; *fruit* a small, yellow, succulent berry, the berries densely compacted in the spike.

Distribution.—In coastal forest throughout North Island, extending in South Island to Banks Peninsula on the east and to Okarito or farther south on the west.

Fig. 54.—*Melicope ternata* (Rutaceae).

Wharangi.

A small, bushy tree, 12–25 ft. high, the bark grey and smooth, or a tall shrub, the leaves, branchlets, and flowers dotted with pellucid oil-glands and aromatic when bruised; *leaves* opposite, long-petioled, 3-foliolate, their leaflets linear-obovate to oblong-ovate, 2–4 in. long, entire, glabrous, bright-green, glossy; *flowers* in axillary, trichotomous panicles, 1–1½ in. long, often unisexual, 4-petalled, greenish; *fruit* of 4 wrinkled cocci, each of which on splitting exposes a shining black seed.

Distribution.—In lowland forests throughout North Island and in the north of South Island, extending on the east to the Seaward Kaikoura Mountains.

Fig. 55.—*Melicytus ramiflorus* (Violaceae).

Mahoe, Whitey-wood.

A small, bushy tree, 12–30 ft. high, with trunk 1–2 ft. diam., or tall shrub, with smooth, whitish bark and brittle twigs; *leaves* alternate, short-petioled, oblong-lanceolate, 2–5 in. long, obtusely serrate, glabrous, dark-green; *flowers* in fascicles on the naked twigs, diœcious, small, 5-petalled, greenish; *fruit* a small, violet, few-seeded berry, $\frac{1}{5}$ in. diam.

Distribution.—Abundant in lowland and montane forests and their outskirts throughout North Island and South Island; but its recorded occurrence in Stewart Island is doubtful.

Fig. 56.—*Metrosideros lucida* (Myrtaceae).

Southern-rata.

A medium-sized tree, 30–60 ft. high, with its trunk frequently of irregular form and 2–4 ft. diam., or a small shrub; *leaves* opposite, short-petioled, lanceolate to broadly lanceolate, acuminate, 1–3 in. long, entire, glabrous, glossy green, dotted with oil-glands; *flowers* in short, terminal cymes, bright crimson, the stamens numerous as in all species of the genus; *fruit* an urceolate, coriaceous capsule, ⅓ in. long, entirely enclosed in the calyx-tube.

Distribution.—In montane and subalpine forests of North Island from about lat. 36° southwards, but generally absent, and abundant on the western side and south of South Island at all altitudes, but far rarer on the east, extending to Stewart Island, where it is extremely plentiful.

Fig. 57.—*Metrosideros robusta* (Myrtaceae).

Northern-rata.

A tall, massive tree from 60 ft. to 100 ft. high, usually commencing life as an epiphyte, with an irregular trunk, often of great size, and spreading branches; *leaves* opposite, short-petioled, elliptic-oblong, ovate-oblong, or elliptic-lanceolate, 1–1½ in. long, entire, glabrous, coriaceous; *flowers* in broad, dense, terminal, many-flowered cymes, dark-scarlet; *fruit* a small, oblong capsule, ¼–⅓ in. long, enclosed to the middle by the old calyx-tube.

Distribution.—In lowland and montane forests throughout North Island, extending to the north of South Island and to near Greymouth on the west, but its exact southern distribution uncertain.

Fig. 58.—*Metrosideros tomentosa* (Myrtaceae).

Pohutukawa, Christmas-tree.

A much-branched, tall tree, 30–70 ft. high, with a massive trunk, 2–5 ft. diam., from which roots are frequently given off, or, in places, merely a low shrub; *leaves* opposite, short-petioled, lanceolate to broadly oblong, 1–4 in. long, entire, white-tomentose beneath, thick, coriaceous; *flowers* in broad, terminal, many-flowered cymes, about 3 in. diam., dark-crimson, the peduncles, pedicels, and calyces clothed with white tomentum; *fruit* a woody capsule, ½ in. long, white-tomentose, enclosed to the middle by the persistent calyx-tube.

Distribution.—On sea-cliffs and in coastal forest in North Island to about lat. 39°, and inland on shores of lakes on the volcanic plateau.

Fig. 59.—*Mida myrtifolia*—syn. *Fusanus Cunninghamii* (Santalaceae).

Maire, Sandalwood.

A slender tree, 10–25 ft. high, with a trunk 1 ft. diam. or less, or a tall shrub; *leaves* alternate, rarely opposite, short-petioled, ovate-lanceolate to oblong-ovate, 2–3 in. long, entire, glabrous, glossy; *flowers* in few- or many-flowered axillary racemes or cymes, small, $\frac{1}{6}$–$\frac{1}{4}$ in. diam., sometimes unisexual, brownish-green, the perianth-tube hemispherical; *fruit* a bright red, narrow-turbinate drupe, $\frac{1}{3}$–$\frac{1}{2}$ in. long.

Distribution.—In lowland forests to south of North Island, but extremely rare south of lat. 38°.

Fig. 60.—*Mida salicifolia* (Santalaceae).

Willow-leaved Maire.

A slender tree, or tall shrub, having most of the characters of *M. myrtifolia*, but distinguished from that species by its narrower leaves, which are linear-lanceolate, acute or acuminate, and 3–5 in. long. Connecting the two species are many hybrids possessing leaves of all forms, from those of the broad-leaved *M. myrtifolia* to those of the narrow-leaved *M. salicifolia*, and both broad and narrow leaves may occur on the same plant.

Distribution.—As for *Mida myrtifolia*.

Fig. 61.—*Myoporum laetum* (Myoporaceae).

Ngaio.

A small, round-headed tree, 15–30 ft. high, with trunk 9 in.–2 ft. diam. and thick, brown, furrowed bark, or a small and at times prostrate, far-extending shrub; *leaves* alternate, rarely opposite, short-petioled, lanceolate, broadly lanceolate, or obovate, 1–4 in. long, serrulate above, glabrous, more or less fleshy, dotted with translucent oil-glands; *flowers* in axillary fascicles of 2–6, the corolla $\frac{1}{2}$ in. diam., 5-lobed, white, spotted purple; *fruit* a reddish-purple, succulent, oblong drupe, $\frac{1}{4}$–$\frac{1}{3}$ in. long.

Distribution.—Chiefly in coastal forests throughout North Island and South Island, but absent in the latter over considerable areas.

Fig. 62.—*Myrtus bullata* (Myrtaceae).

Ramarama.

A small tree, 15–25 ft. high, but frequently a tall shrub, with young leaves and branchlets tomentose; *leaves* opposite, short-petioled, ovate to orbicular-ovate, 1–2 in. long, entire, glabrous, blistered above, reddish, dotted with glands; *flowers* axillary, solitary, 4–5-petalled, white; *fruit* a broadly ovoid, dark-red or almost black, 2-celled berry, $\frac{1}{3}$ in. long.

Distribution.—In open lowland forests, or their outskirts, throughout North Island, but in South Island confined to the northern part not far from the sea.

FIG. 63.—*Nothofagus cliffortioides* (Fagaceae).

MOUNTAIN-BEECH.

Usually a small tree, 20–40 ft. high, but higher in certain localities (*e.g.*, near Lake Wakatipu), 1–2 ft. diam., or merely a low shrub, the bark smooth, dark; *leaves* alternate, short-petioled, distichous, ovate, ovate-oblong, or rounded-oblong, $\frac{1}{6}$–$\frac{2}{3}$ in. long, acute or subacute, entire, usually white-tomentose beneath, the base unequally rounded, cordate or truncate; *flowers* monœcious, the male axillary, usually solitary, very numerous, red; *fruit* of 2–3-winged ovoid nuts, enclosed in a small, ovoid, 3-lobed fruiting-involucre, $\frac{1}{6}$–$\frac{1}{4}$ in. long.

Distribution.—Subalpine forests in North Island from the mountains near East Cape southwards, but absent on Mount Egmont and the Tararuas. In South Island throughout the montane and subalpine belts, except in part of Westland, and common near sea-level to west of the coastal mountains of Nelson and the Southern Alps.

Fig. 64.—*Nothofagus fusca* (Fagaceae).

Red-beech.

A tall, massive tree, 60–100 ft. or more high, with trunk 3–6 ft. diam., often buttressed at the base, and the bark thick, furrowed, dark-brown, rusty-brown, or almost black; *leaves* alternate, short-petioled, broadly ovate to ovate-oblong, 1–1½ in. long, coarsely and sharply serrate, cuneate at base; *flowers* monœcious, 2–3 at end of a short, curved, axillary peduncle; *fruit* of 2–3-winged, pubescent, ovoid nuts, enclosed in a woody, pubescent, ovoid-globose fruiting-involucre, ⅓–½ in. long.

Distribution.—In lowland and montane forests from a little south of lat. 37° on the Thames mountains southwards in North Island (but absent on Mount Egmont), and throughout South Island where the rainfall is high, except southwards from the River Taramakau for about 100 miles and in southern Southland.

Fig. 65.—*Nothofagus Menziesii* (Fagaceae).

Silver-beech.

A tall, massive tree, 60–100 ft. high, with frequently a buttressed trunk 2–5 ft. diam., but sometimes a shrub, the bark greyish-white (cherry-like in young trees), flaking, and more or less furrowed; *leaves* alternate, short-petioled, broadly ovate-deltoid, rhomboid, or almost orbicular, $\frac{1}{3}$–$\frac{1}{2}$ in. long, unequally cuneate at base, doubly crenate, glabrous, dark-green; *flowers* monœcious, the males axillary, solitary, the perianth 4–6-toothed; *fruit* of 2–3-winged, puberulous nuts, enclosed in the faintly pubescent fruiting-involucre, $\frac{1}{4}$–$\frac{1}{2}$ in. long.

Distribution.—As for *Nothofagus fusca*, but ascends higher, and is plentiful in western Southland east of the Divide, extending to the Longwood Range. It also occurs in the neighbourhood of Dunedin and on the Blue Mountains.

Fig. 66.—*Nothofagus Solandri* (Fagaceae).

Black-beech.

Usually a medium-sized tree, 40–70 ft. high, but occasionally higher, the trunk, 2–4 ft. diam., covered with furrowed, rough, black bark; *leaves* alternate, short-petioled, linear-oblong to broad-oblong, $\frac{1}{4}$–$\frac{3}{4}$ in. long, obtuse, cuneate at base, entire, white-tomentose beneath; *flowers* monœcious, the males solitary or 2–3 on a common peduncle, each seated on a shallow, 4–5-toothed perianth and containing 8–13 stamens; *fruit* of 2–3-winged nuts enclosed in a 3-lobed, glabrous or pubescent, ovoid fruiting-perianth, $\frac{1}{4}$ in. long.

Distribution.—Lowland and montane forest, frequently local; in North Island, extending southwards in the mountainous areas from the Mamaku Plateau (extremely rare), but absent in western Auckland and western Taranaki, and, in South Island, common in northern Marlborough and the adjacent parts of Nelson, extending southwards at intervals through eastern Marlborough and Canterbury to Banks Peninsula and Alford Forest. Its distribution—if it occurs at all—in western Nelson and Southland is not known and demands investigation.

FIG. 67.—*Nothofagus truncata*—syn. *N. fusca* var. *Colensoi* (Fagaceae).

HARD-BEECH.

A tall, massive tree of the dimensions and habit of *N. fusca*, to which it is closely allied, but its bark is dark slaty-grey to almost black, and the scales small; *leaves* rather smaller and proportionately broader than those of *N. fusca*, the teeth more numerous, smaller, and blunt, their colour paler and texture thicker; *flowers* and *fruit* probably much the same as for *N. fusca*, but they have not yet been described.

Distribution.—Lowland forests in North Island in a few localities from near Kaitaia southwards to the Thames mountains, where it may have been common; thence its distribution is the same as that of *N. Solandri*. In South Island it is abundant in lowland forests in northern Marlborough and the adjacent parts of Nelson, whence it extends southwards on the west, but probably not in great abundance, almost to the River Taramakau.

Fig. 68.—*Nothopanax arboreum* (Araliaceae).

Whauwhaupaku.

A small, round-headed tree, 12–25 ft. high, with a slender trunk; *leaves* alternate, digitately 5–7-foliolate, with stout, sheathing petioles 2–10 in. long, and leaflets narrow-oblong to obovate-oblong, 3–7 in. long, with petioles ½–1 in. long, serrate, glabrous, smooth, coriaceous, dark-green; *flowers* in large, terminal, compound umbels, the secondary rays each bearing a 10–15-flowered umbel, the flowers diœcious, 5-petalled, ¼ in. diam.; *fruit* broader than long, compressed, ¼–⅓ in. diam., 2-celled, purplish-black.

Distribution.—In lowland forests throughout North Island and South Island.

FIG. 69.—*Nothopanax Colensoi* (Araliaceae).

ORIHAU, MOUNTAIN IVY-TREE.

A small, round-headed tree, 15–20 ft. high, closely related to *N. arboreum*, but the leaves are 3–5-foliolate, the leaflets sessile or nearly so, more coriaceous, and the veins indistinct, and the umbels are smaller and with fewer primary rays. According to Cheeseman, in most northern localities the leaves are 3–5-foliolate, but 3-foliolate to the south of the volcanic plateau. Doubtless the species includes several varieties, but such, as yet, are insufficiently known.

Distribution.—In the montane and subalpine belt of North Island from Little Barrier Island by way of the Thames mountains southwards to South Island and Stewart Island, where it is common in both islands descending in the wettest localities to sea-level.

Fig. 70.—*Nothopanax Edgerleyi* (Araliaceae).

Raukawa.

A small tree, 20–40 ft. high, its trunk, 12–18 in. diam., with a distinct juvenile form with deeply-cut or lobed digitate leaves; *leaves* (adult) alternate, long-petioled, lanceolate to oblong- or obovate-lanceolate, with the blade, 2–8 in. long, entire, glabrous, glossy bright-green, thin, aromatic when bruised; *flowers* in small umbels, $\frac{1}{2}$–$\frac{3}{4}$ in. diam., arranged in slender panicles 1–2 in. long, unisexual, small, greenish-white; *fruit* 3–4-celled, globose, $\frac{1}{8}$ in. diam., mottled.

Distribution.—In lowland and montane forests of all three Islands from near Kaitaia southwards, but usually montane in North Island.

Fig. 71.—*Nothopanax simplex* (Araliaceae).

Haumakaroa.

A low tree, 15–26 ft. high, or a tall shrub, having a distinct juvenile form with large, much-cut, thin, toothed leaves, in some forms very like those of *N. Edgerleyi*; *leaves* (adult) alternate, long-petioled, lanceolate to oblong, 2–5 in. long, more or less serrate, glabrous, glossy; *flowers* in short compound umbels, unisexual, small, greenish-white; *fruit* 2-celled, succulent, orbicular, ⅛ in. long, compressed.

Distribution.—In montane and subalpine forests in North Island from the Thames mountains southwards, extending throughout South Island and Stewart Island and lowland in localities of high rainfall.

Fig. 72.—*Nothopanax Sinclairii* (Araliaceae).

MOUNTAIN-PANAX.

A small tree, 15–25 ft. high, or tall shrub, closely related to *N. simplex*, but it lacks the cut-leaved juvenile form and its adult leaves are compound; it may also be confused with hybrids between *N. Colensoi* and *N. simplex*; *leaves* alternate, long-petioled, 3–5-foliolate, with the leaflets obovate or oblong-lanceolate, 1–3-in. long, sessile or almost so, sharply serrate, glabrous, dull-green; *flowers* in 3–10-flowered, small umbels, unisexual; *fruit* 2-celled, orbicular, $\frac{1}{8}$–$\frac{1}{6}$ in. long, compressed.

Distribution. — In subalpine forests of North Island from the Thames mountains southwards.

Fig. 73.—*Olea Cunninghamii* (Oleaceae).

Maire-raunui, Black-maire.

A medium-sized tree, 30–70 ft. high, with the trunk 2–4 ft. diam., and the juvenile leaves longer and narrower than the adult and so readily mistaken for those of *O. lanceolata*, which, however, are shorter and acuminate; *leaves* opposite, short-petioled, lanceolate to oblong-lanceolate, 3–6 in. long, entire, glabrous, the veins obscure; *flowers* in short, stout, densely pubescent racemes, ½–1 in. long, 8–18-flowered, the flowers diœcious, minute, and without petals; *fruit* an ovoid, 1–2-seeded, red drupe, ½–⅔ in. long.

Distribution.—In lowland forests throughout North Island, but frequently rare, and the vicinity of the Marlborough Sounds and adjacent parts of Nelson, extending southwards on the east to a little beyond Kaikoura.

Fig. 74.—*Olea lanceolata* (Oleaceae).

White-maire.

A small tree, 20–40 ft. high, with the trunk, 1–3 ft. diam., and white bark; *leaves* opposite, short-petioled, linear- to ovate-lanceolate, 2–4 in. long, entire, glabrous, the veins prominent; *flowers* in slender, glabrous or hardly hairy, 6–12-flowered racemes, $\frac{1}{3}$–$\frac{3}{4}$ in. long, diœcious, minute, without petals; *fruit* an ovoid, red, rather pulpy drupe, $\frac{1}{2}$ in. long.

Distribution.—In lowland forests throughout North Island but not abundant, and sparingly near the Marlborough Sounds and adjacent parts of Nelson.

Fig. 75.—*Olea montana* (Oleaceae).

Orooro, Narrow-leaved Maire.

A small tree, 20–35 ft. high, with the trunk 1–2 ft. diam.; *leaves* opposite, short-petioled, linear to linear-lanceolate, $1\frac{1}{2}$–$3\frac{1}{2}$ in. long, the juvenile up to 6 in. long, entire, glabrous, the veins obscure; *flowers* in 5–10-flowered, glabrous, axillary racemes, about 1 in. long, diœcious, minute, without petals; *fruit* a narrow, ovoid, red drupe, $\frac{1}{4}$–$\frac{1}{3}$ in. long.

Distribution.—Lowland forests in North Island from near Mangonui to Cook Strait, but commonest in the south, extending to the neighbourhood of the Marlborough Sounds and the adjacent parts of Nelson in South Island.

Fig. 76.—*Olearia rani*—syn. *O. Cunninghamii* (Compositae).

Heketara.

A small tree, 15–25 ft. high, or a tall shrub, its branches, petioles, inflorescences, and leaves beneath clothed with white or buff-coloured tomentum; *leaves* alternate, short-petioled, broadly ovate, linear-oblong, or elliptic, 2–6 in. long, coarsely and irregularly dentate; *flower-heads* in very large, much-branched, wide-spreading panicles, 3–7 in. long, of 12–24 florets, the rays numerous, white; *fruit* a glabrous or almost glabrous achene.

Distribution.—In well-lit, lowland forests throughout North Island, extending to Marlborough and Nelson north of the River Wairau.

Fig. 77.—*Paratrophis microphylla* (Moraceae).

Turepo, Milk-tree.

A small tree with milky juice, 15–35 ft. high, with the trunk 9 in.–1½ ft. diam., rough grey bark, and long-persisting juvenile form with much-interlaced stems and small leaves, generally lobed or deeply cut; *leaves* (adult) alternate, short-petioled, oblong-ovate to elliptic, ⅓–1½ in. long, crenate or crenate-dentate, coriaceous, dark-green, the veins much reticulated; *flowers* in very short spikes (frequently diseased, and then converted into large, much-branched panicles with aborted flowers), diœcious, minute, sessile, intermixed with peltate scales; *fruit* a small, globose, red drupe, ⅙ in. diam., 1–3 to each spike.

Distribution.—Common in lowland forests throughout North Island and South Island.

Fig. 78.—*Paratrophis opaca* (Moraceae).

Large-leaved Milk-tree.

A small tree with milky juice, 15–25 ft. high, having no per-
istent juvenile form; *leaves* ovate- to elliptic-oblong, $1\frac{1}{2}$–$3\frac{1}{2}$ in. long,
btusely-crenate or crenate-dentate, glabrous, reticulated; *flowers*
n longer spikes than in *P. microphylla*, diœcious, the males many-
owered, the females 8–25-flowered or more; *fruit* a broadly ovoid,
ed drupe, $\frac{1}{4}$ in. long, and many ripening on each spike. (On right
f figure is a diseased inflorescence.)

Distribution.—In North Island coastal forest from Bay of
slands southwards, extending to the islands in Cook Strait and to
he vicinity of the Marlborough Sounds.

Fig. 79.—*Pennantia corymbosa* (Icacinaceae).

Kaikomako.

A small tree, 15–40 ft. high, with light-grey bark, the branchlets petioles, and inflorescence pubescent, and with a long-persistin juvenile form of much-interlacing twigs and small leaves, lobed o toothed above; *leaves* (adult) alternate, short-petioled, oblong t obovate-oblong, 1–4 in. long, sinuate or irregularly dentate or lobed glabrous; *flowers* in terminal panicles, 2–3 in. long, diœcious, small 5-petalled, white, fragrant; *fruit* a fleshy, black drupe, about ⅓ in long.

Distribution.—Well-lit lowland forests throughout North Islan and South Island.

Fig. 80.—*Persoonia toru* (Proteaceae).

Toru.

A small tree, 15–30 ft. high, its trunk 6–12 in. diam.; *leaves* lternate, short-petioled, narrow linear-lanceolate, 4–8 in. long, entire, labrous, thick, very coriaceous, smooth, polished, pale-green; *owers* in axillary, 6–12-flowered panicles, clothed with rusty pubes-ence, the perianth, $\frac{1}{4}$–$\frac{1}{3}$ in. long, yellowish-brown, fragrant; *fruit* n oblong, reddish, 1–2-celled drupe, $\frac{1}{2}$–$\frac{2}{3}$ in. long.

Distribution.—An early member in the development of lowland orest, also in open shrubland, from north of North Island to a little outh of lat. 38°.

Fig. 81.—*Phyllocladus alpinus* (Podocarpaceae).

Mountain-toatoa.

A small tree, 12–40 ft. high or more, with trunk, 1–2 ft. diam., or a shrub, with leaf-like branchlets (cladodes) which function as leaves, and the quite insignificant true leaves (as in all the species) only on seedlings or reversion-shoots; *cladodes* alternate or almost opposite, short-petioled, linear-oblong to oblong-rhomboid, ½–2 in. long, lobed or pinnatifid, glabrous, thick, glaucous beneath; *flowers* monœcious, the male catkins in fascicles of 2–5 at ends of branches, the females in globose heads near base of cladodes on their margins; *ripe heads* ¼ in. diam., the scales bright-red and fleshy, the small black nuts (the fruits) protruding.

Distribution.—In the subalpine belt of North Island and South Island, extending from Cape Colville to the vicinity of Foveaux Strait, but descending to sea-level to the west of the coastal mountains of Nelson, the Southern Alps, and south of Southland.

FIG. 82.—*Phyllocladus glaucus* (Podocarpaceae).

TOATOA.

A small tree, 20–40 ft. high, its trunk 1–2 ft. diam., and the branches in whorls; *cladodes* alternate, short-petioled, distichous, pinnately arranged on a rhachis 4–12 in. long, rhomboid or obliquely ovate-cuneate, 1–2½ in. long, deeply toothed or lobed, glaucous when young; *flowers* diœcious or monœcious, the males ⅓–1 in. long, in fascicles of 10–20 at tips of branchlets, the females in terminal globose heads on short peduncles inserted on the rhachis below the cladode; *ripe heads*, ½ in. long, with 8–20 nuts (the fruits) exserted beyond the thickened scales.

Distribution.—In lowland and montane forests from the north of Hokianga to Rainbow Mountain (volcanic plateau) and to somewhat south of lat. 38°.

Fig. 83.—*Phyllocladus trichomanoides* (Podocarpaceae).

Tanekaha.

A moderate-sized tree, 50–70 ft. high, the branches whorled; *cladodes* alternate, short-petioled, distichous on the whorled rhachises, the latter with their cladodes resembling pinnate leaves, each cladode obliquely-cuneate or rhomboid, $\frac{1}{2}$–1 in. long, pinnatifid or lobed, glabrous, thick; *flowers* monœcious, the male in catkins $\frac{1}{3}$–$\frac{1}{2}$ in. long, in fascicles at the tips of the branches, and the females on the margins of much-reduced, terminal cladodes, frequently merely a peduncle, each flower in the axil of a minute bract; *fruit* a compressed nut half exserted beyond the thickened fleshy scale.

Distribution.—In lowland forests throughout North Island, extending to the northern parts of Marlborough and Nelson in South Island and on the west to near Westport.

FIG. 84.—*Pisonia Brunoniana* (Nyctaginaceae).

PARAPARA.

A small tree, 12–40 ft. high, or a tall shrub; *leaves* usually opposite, short-petioled, oblong to elliptic-oblong, 4–15 in. long, glabrous, entire, thin; *flowers* in many-flowered, terminal, much-branched cymes, the perianth $\frac{1}{5}$ in. long, greenish, funnel-shaped, with a bell-shaped mouth; *fruit* an elongated linear utricle, 1–$1\frac{1}{4}$ in. long, 5-ribbed, narrowed above, and extremely viscid, so that small birds coming in contact with it may be glued down to the fruit by their feathers.

Distribution.—On the coast from the Three Kings Islands, along the east of North Island, and on the islands adjacent to East Cape.

FIG. 85.—*Pittosporum crassifolium* (Pittosporaceae).

KARO.

A small tree, 15–30 ft. high, or frequently a dense shrub, the branches, leaves beneath, petioles, and inflorescence covered with white tomentum; *leaves* alternate, short-petioled, linear- to oblong-obovate, entire, white-tomentose beneath, coriaceous, shining, dark-green; *flowers* in short terminal umbels, unisexual, 5-petalled, chocolate-coloured; *fruit* a large, subglobose, white-tomentose capsule 1 in. or more long, generally 3-valved, the valves woody and when open exposing the black seeds embedded in a viscid secretion.

Distribution.—From the north of North Island, along the coast, to somewhat south of lat. 38°.

FIG. 86.—*Pittosporum eugenioides* (Pittosporaceae).

TARATA.

A small, round-headed tree, 20–40 ft. high, with the trunk 1–2 ft. liam. and pale bark; *leaves* alternate, rather long-petioled, elliptic o elliptic-oblong, 2–4 in. long, often with undulate margins, glabrous, lossy, lemon-scented when bruised; *flowers* in much-branched, nany-flowered, terminal umbels, polygamous or diœcious, small, ellow, very fragrant; *fruit* a woody, 2-valved, elliptic-oblong capule, ½ in. long, the seeds embedded in a viscid secretion.

Distribution.—Lowland forests throughout North Island and nost of South Island, but rare over wide areas to the west of the outhern Alps.

FIG. 87.—*Pittosporum tenuifolium* (Pittosporaceae).

KOHUHU.

A small tree, 15–30 ft. high, with slender trunk and smooth, dark-grey bark, but the species badly understood, for many distinct unnamed varieties and the hybrids between them and allied species are included under this name, so no exact diagnosis is possible; *leaves* alternate, short-petioled, oblong, oblong-ovate, elliptic-obovate, $\frac{1}{3}$–$2\frac{1}{2}$ in. long, obtuse, acute or acuminate, entire, glabrous, thin or fairly thick; *flowers* axillary, solitary or fascicled, $\frac{1}{2}$ in. long, dark-purple, fragrant; *fruit* a 3-valved, obovoid or subglobose capsule, about $\frac{1}{2}$ in. diam., the valves thin, and the seeds embedded in a viscid secretion.

Distribution.—Abundant in lowland and montane forests throughout North Island and most of South Island, but absent west of the Southern Alps.

Fig. 88.—*Pittosporum umbellatum* (Pittosporaceae).

Haekaro.

A small tree, 12–25 ft. high, or a shrub, glabrous except on the young shoots; *leaves* alternate, short-petioled, obovate-, elliptic-, or lanceolate-oblong, 2–3 in. long, entire, glabrous; *flowers* in many-flowered terminal umbels; *fruit* a woody, tetragonous or 4-lobed, 2-valved, glabrous capsule, the seeds embedded in a viscid secretion.

Distribution.—In coastal forest and scrub from the north of North Island, on the east coast, southwards to somewhat beyond lat. 38°.

Fig. 89.—*Pittosporum virgatum* (Pittosporaceae).

A small tree, 15–20 ft. high, or a tall shrub, distinguished at once by its young parts being rusty-pubescent and its long-persisting juvenile narrow, lobed, or pinnatifid leaves; *leaves* (adult) alternate, short-petioled, elliptic-obovate, oblong-ovate, to oblong-lanceolate, 1–2 in. long, entire or slightly sinuate; *flowers* in terminal, 2–5-flowered umbels, the sepals densely rusty-pubescent; *fruit* a globose, 2-valved, glabrous (when mature) capsule, ½ in. diam., with the seeds embedded in a viscid secretion.

Distribution.—In North Island, mainly on the eastern coast-line from near Ahipara to about lat. 37°.

Fig. 90.—*Plagianthus betulinus* (Malvaceae).

Manatu, Lowland-ribbonwood.

A small, deciduous tree, 20–50 ft. high, with a long-persisting juvenile form, with the branches interlaced, and abundant, small, ovate or ovate-lanceolate leaves, $\frac{1}{3}$–$\frac{3}{4}$ in. long, serrate, crenate, or lobed; *leaves* (adult) alternate, short-petioled, ovate or ovate-lanceolate, acuminate, 1–3 in. long, deeply irregularly-lobed, glabrous, thin; *flowers* (see right hand lower corner of fig. 90) in large terminal panicles, 4–9 in. long, almost diœcious, very numerous, small, green; *fruit* a thin, downy, ovoid capsule, $\frac{1}{6}$ in. long.

Distribution.—In lowland forests of alluvial valleys in the three Islands.

Fig. 91.—*Podocarpus acutifolius* (Podocarpaceae).

Needle-leaved Totara.

A small tree, 12–30 ft. high, with a trunk 6 in.–1½ ft., but usually a dense shrub; *leaves* alternate or almost opposite, almost sessile, linear, ½–1 in. long, acuminate, pungent, entire, glabrous; *flowers* diœcious, the male catkins ⅓–½ in. long, solitary or in fascicles of 2–4 at the top of a peduncle ½ in. long, the female flowers minute, solitary or 2 at the top of a short, swollen peduncle; *fruit* a small, ovoid nut seated on the enlarged, fleshy, red peduncle.

Distribution.—In lowland or montane forest or scrub from near the Marlborough Sounds, in South Island, westwards to south Westland.

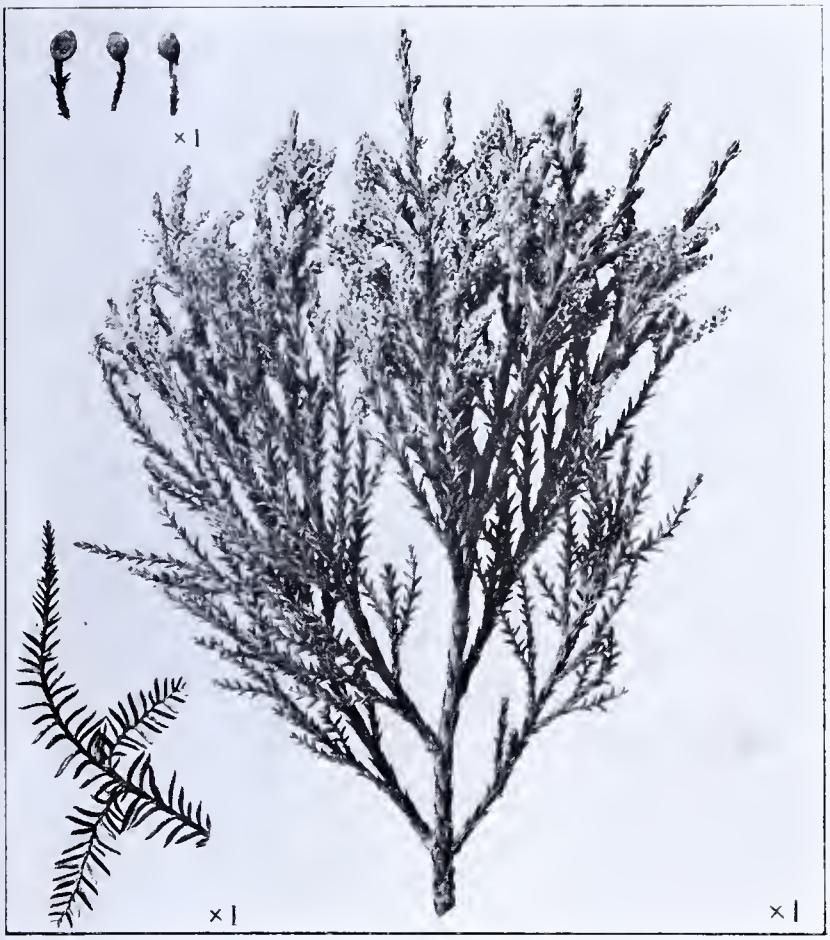

Fig. 92.—*Podocarpus dacrydioides* (Podocarpaceae).

Kahikatea, White-pine.

A tall tree, 80–120 ft. high (195 ft. has been recorded), with a long, straight, unbranched, frequently fluted trunk, 2–4 ft. or more diam., buttressed at the base, and a long-persisting juvenile form with slender twigs and distichous, linear, falcate, flat leaves, $\frac{1}{6}$–$\frac{1}{4}$ in. long; *leaves* (adult) scale-like, subulate-lanceolate, $\frac{1}{12}$–$\frac{1}{8}$ in. long, keeled, closely appressed; *flowers* diœcious, the males in small terminal, sessile catkins, the female minute, solitary, terminal; *fruit* a black, ovoid nut, $\frac{1}{6}$ in. long, seated on the greatly-enlarged, bright-red, succulent peduncle.

Distribution.—Dominant in lowland semi-swamp forest throughout North Island and South Island, but extremely rare (apparently only a few trees) in Stewart Island.

FIG. 93.—*Podocarpus ferrugineus* (Podocarpaceae).

MIRO.

A tall tree, 50–80 ft. high, with a trunk 1–3 ft. diam., and greyish-brown bark; *leaves* alternate, sessile, distichous, linear, $\frac{1}{2}$–$\frac{2}{3}$ in. long, broader than those of *P. spicatus*, acute, falcate, entire, glabrous; *flowers* diœcious, the males in solitary axillary catkins, about $\frac{2}{3}$ in. long, the female, consisting of an ovule solitary at top of a short, curved peduncle, clothed with minute bracts; *fruit* drupaceous, broadly-oblong, $\frac{3}{4}$ in. long, reddish-purple with a glaucous bloom, the outer layer pulpy.

Distribution.—In lowland forests throughout the three Islands.

FIG. 94.—*Podocarpus Hallii* (Podocarpaceae).

THIN-BARK TOTARA.

A medium-sized tree, 25–60 ft. high, with a trunk 1–3 ft. diam., and thin, papery bark; *leaves* alternate, short-petioled, linear, $\frac{3}{4}$–1 in. long, acute, pungent, entire, glabrous; *flowers* diœcious, the male in axillary, short-stalked catkins, $\frac{1}{2}$–$\frac{2}{3}$ in. long, the female axillary, minute, solitary or 2 at the top of a short peduncle; *fruit* a narrow, ovoid, acute nut, seated on an enlarged, succulent, red peduncle.

Distribution.—In lowland, montane, and subalpine forests from near Kaitaia southwards throughout South Island and Stewart Island.

Fig. 95.—*Podocarpus spicatus* (Podocarpaceae).

Matai, Black-pine.

A tall tree, 40–80 ft. high, with a trunk 2–4 ft. diam., the bark bluish-black and shining, and having a long-persisting juvenile form made up of long, slender, flexuous, weeping, entangled branchlets clothed sparingly with very short, narrow, acute brownish leaves; *leaves* (adult) alternate, distichous, linear, $\frac{1}{3}$–$\frac{1}{2}$ in. long, glaucous beneath; *flowers* diœcious, spicate, the males numerous, the females 3–8 to each spike; *fruit* drupaceous, black, succulent, globose, $\frac{1}{4}$–$\frac{1}{3}$ in. long.

Distribution.—Lowland forests in the three Islands, but very rare in Stewart Island.

Fig. 96.—*Podocarpus totara* (Podocarpaceae).

Totara.

A tall, massive tree, closely related to *P. Hallii* and distinguished chiefly by its bark (there are also apparently hybrids between them), 40–100 ft. high, with the trunk, 2–6 ft. diam., covered with thick, furrowed bark; *leaves* alternate, sessile, linear, $\frac{1}{2}$–1 in. long, pungent, entire, glabrous, dull brownish-green; *flowers* diœcious, the male, $\frac{1}{2}$–$\frac{2}{3}$ in. long, almost sessile, the female as for *P. Hallii*; *fruit* an ovoid-oblong nut rounded at apex and seated on the red, enlarged, succulent peduncle.

Distribution.—In lowland and montane forests in North Island and South Island, but absent in Stewart Island, where it is represented by *P. Hallii*.

FIG. 97.—*Pseudopanax crassifolium*, var. *unifoliolatum* (Araliaceae).

HOROEKA, LANCEWOOD.

A small round-headed tree, 20–40 ft. high, with the trunk naked below and 9–18 in. diam., having a long-persisting juvenile form with a long, unbranched main stem which gives off deflexed, rigid, short-toothed (but the teeth are frequently quite large), thick, long, narrow-linear leaves, 6–12 in. long; *leaves* (adult) alternate, short-petioled, linear, linear-oblong, or linear-obovate, 3–8 in. long, entire or serrate, glabrous; *flowers* diœcious, in terminal compound umbels, the male with 5-toothed calyx and 5 petals, the female with a 4–5-celled ovary; *fruit* a globose, black drupe, $\frac{1}{5}$ in. diam.

Distribution.—In lowland and montane forests throughout the three Islands. North of lat. 38° comes the var. *trifoliolatum*, distinguished by its trifoliolate later juvenile leaves; but this variety is badly understood.

Fig. 98.—*Pseudopanax ferox* (Araliaceae).

Toothed-lancewood.

A small tree, 12–20 ft. high, and 6–12 in. diam., with a persistent juvenile form as for *P. crassifolium*, but the long, narrow, decumbent leaves are furnished with large, broad, hooked, sharp teeth; *leaves* (adult) alternate, short-petioled, linear-obovate, 3–6 in. long, entire, or obscurely toothed near apex, glabrous, thick, stiff; *flowers* diœcious, in terminal umbels, the male umbels of 6–10 rays bearing numerous flowers in a raceme, and the female umbels with shorter rays and fewer flowers; *fruit* much larger than in *P. crassifolium*, ⅓ in. diam.

Distribution.—From near Ahipara, in north of North Island, to south of South Island, but rare and local.

FIG. 99.—*Pseudopanax Lessonii* (Araliaceae).

HOUPARA.

A small tree, 12–20 ft. high, or a much-branched shrub; *leaves* alternate, long-petioled, digitatively 3–5-foliolate, the leaflets ovate- or oblong-lanceolate, 1–4 in. long, entire or sinuate-serrate, glabrous, thick, shining dark-green; *flowers* in compound terminal umbels, the flowers diœcious, $\frac{1}{5}$ in. diam., the ovary 5-celled, the styles very short; *fruit* broadly oblong, $\frac{1}{4}$ in. diam., 5-celled.

Distribution.—North Island, usually near the coast from the north to somewhat south of lat. 38°.

Fig. 100.—*Quintinia acutifolia* (Saxifragaceae).

Westland Quintinia.

A small, slender tree, 20–40 ft. high and 1–2 ft. diam., its leaves, branchlets, and racemes covered with scurfy scales; *leaves* alternate, short-petioled, obovate to elliptic-oblong, 3–7 in. long, remotely obscurely sinuate-serrate, yellowish, but midrib and veins green; *flowers* in many-flowered racemes, 2–4 in. long, small, pale-lilac; *fruit* a woody capsule, $\frac{1}{5}$ in. long.

Distribution.—Montane forests on east of North Island from Little Barrier Island to somewhat south of lat. 38° on the east, and near Whangamomona (Taranaki), but far more abundant in lowland forests of South Island to the west of the coastal mountains of Nelson and the Southern Alps, ascending into the lower subalpine belt.

Fig. 101.—*Quintinia serrata* (Saxifragaceae).

Tawheowheo, Common Quintinia.

A small tree, 20–35 ft. high, in most particulars resembling *Q. acutifolia*, but distinguished by its much narrower linear-lanceolate leaves, which are greenish-yellow marked with conspicuous dark-green and reddish blotches and have crimped margins, and by the broader petals, longer filaments, and rather smaller capsules.

Distribution.—In montane forests of North Island (frequently in company with *Ixerba brexioides*) from Mangonui to northern Hawke's Bay and northern Taranaki.

Fig. 102.—*Schefflera digitata* (Araliaceae).

Pate.

A much-branched, small tree, 15–25 ft. high, or a tall shrub; *leaves* alternate, long-petioled, digitately 7–10-foliolate, the leaflets, oblong or obovate, 3–7 in. long, glabrous, finely sharply-serrate, thin, pale-green; *flowers* in axillary panicles, 8–12 in. long, polygamous or diœcious, small, greenish, $\frac{1}{4}$–$\frac{1}{3}$ in. long; *fruit* drupaceous, in large bunches, globose, $\frac{1}{10}$–$\frac{1}{8}$ in. long, juicy, violet.

Distribution.—In wettish parts of lowland forests in the three Islands.

FIG. 103.—*Shawia paniculata*—syn. *Olearia Forsteri* (Compositae).

AKIRAHO, GOLDEN AKEAKE.

A small tree, 15–20 ft. high, with the trunk 6 in.–2 ft. diam., or a tall shrub, with grooved, angular tomentose branchlets; *leaves* alternate, short-petioled, oblong to broadly ovate, $1\frac{1}{2}$–3 in. long, entire, undulate, white-tomentose beneath, stiff, coriaceous; *flowers* in numerous heads on branched corymbs, the heads small, sessile, narrow, $\frac{1}{6}$–$\frac{1}{5}$ in. long, and of only 1-floret; *fruit* a rather broad, pubescent achene.

Distribution.—Frequently near the coast, but ascends into the subalpine belt, extending from about lat. 38° in North Island to near Oamaru on the east of South Island and Greymouth on the west.

Fig. 104.—*Sideroxylon novo-zelandicum* (Sapotaceae).

Tawapou.

A small tree, 25–40 ft. high, with a trunk 1–3 ft. diam., its branches and petioles yielding a milky juice; *leaves* alternate, short-petioled, elliptic- or oblong-obovate, 2–4 in. long, obtuse, entire, glabrous, marked with parallel veins extending from midrib to margin, shining; *flowers* axillary, polygamous, solitary or rarely 2 together, small, $\frac{1}{8}$–$\frac{1}{6}$ in. diam.; *fruit* a large, broadly-oblong or obovoid berry, 1 in. or more long.

Distribution.—On rocky headlands and small islands on east of North Island from near Bay of Islands to Tolaga Bay, and on west near Maunganui Bluff and somewhat to the north of Manukau Harbour.

Fig. 105.—*Suttonia australis*—syn. *Myrsine Urvillei* (Myrsinaceae).

Mapou.

A small tree, 10–20 ft. high, or a tall shrub, frequently mistaken, when not in fruit, for *Pittosporum tenuifolium*, but at once distinguished by its red twigs and leaves dotted with pellucid glands; *leaves* alternate, short-petiolate, oblong or ovate-oblong, 1–2 in. long, margins undulate, glabrous except on midrib; *flowers* crowded in fascicles below the leaves on the otherwise naked twigs, unisexual, small, $\frac{1}{15}$–$\frac{1}{10}$ in. long, whitish, the calyx 4-lobed and petals 4; *fruit* a 1-seeded, small, rounded, black drupe, $\frac{1}{8}$ in. diam.

Distribution.—Common in lowland and montane forests in the three Islands.

Fig. 106.—*Suttonia salicina* (Myrsinaceae).

Toro.

A small tree, 15–30 ft. high, with the branches leafy only near their extremities; *leaves* alternate, short-petioled, linear or linear-oblong, 3–7 in. long, obtuse, entire, glabrous, pale-green, smooth, dotted with pellucid glands; *flowers* crowded in fascicles on the branchlets below the leaves, unisexual, $\frac{1}{10}$–$\frac{1}{8}$ in. diam., the calyx 5-lobed, the petals 5; *fruit* a 1–2-seeded, red, oblong drupe, $\frac{1}{3}$ in. long.

Distribution.—In lowland forests throughout North Island, extending in South Island to northern Marlborough and Nelson and on the west to near Greymouth.

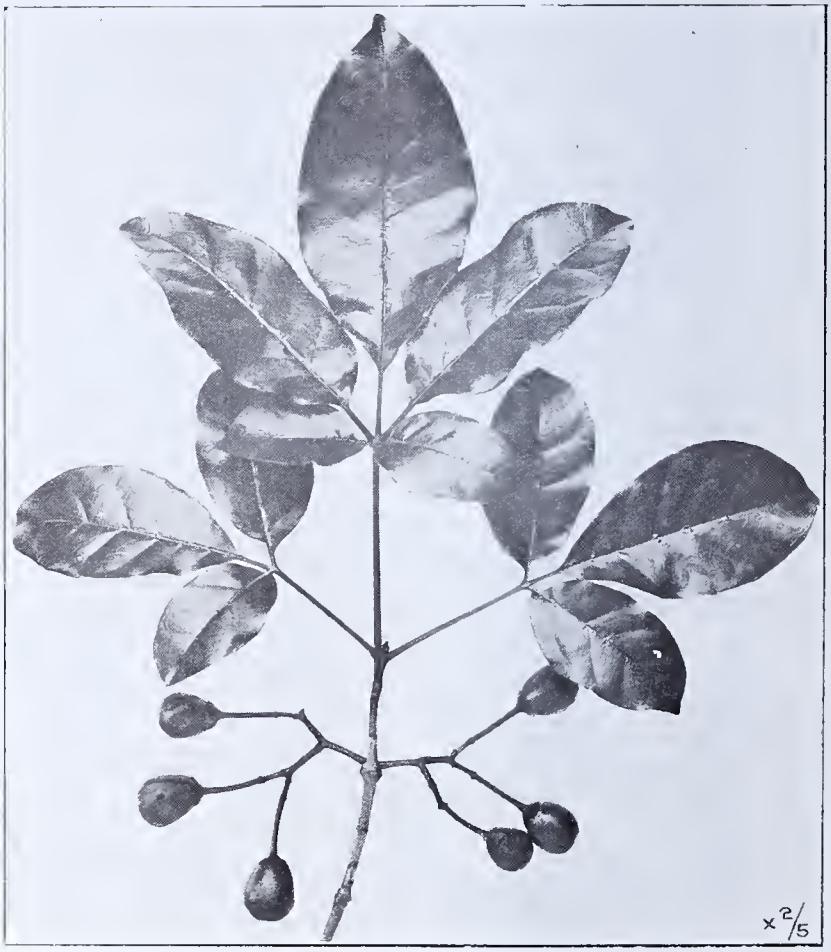

Fig. 107.—*Vitex lucens* (Verbenaceae).

Puriri.

A medium-sized, massive tree, 40–60 ft. high, the trunk 2–5 ft. diam., and the branchlets angled; *leaves* opposite, long-petioled, digitately 3–5-foliolate, the leaflets elliptic-oblong or obovate, 2–5 in. long, entire, glabrous, glossy dark-green; *flowers* in 4–15-flowered, branched, axillary panicles, dull-red, 1 in. long, the corolla 2-lipped; *fruit* a bright-red, almost globose drupe, $\frac{2}{3}$–$\frac{3}{4}$ in. long.

Distribution.—In forests from the north of North Island to Mahia Peninsula on the east and Cape Egmont on the west, but rare south of lat. 37°.

Fig. 108.—*Weinmannia racemosa* (Cunoniaceae).

Kamahi.

A tall, massive tree, 50–80 ft. high, with frequently an irregular trunk 2–4 ft. diam.; *leaves* opposite, short-petioled, oblong-lanceolate, oblong-ovate, to orbicular-ovate, 1–4 in. long, coarsely obtusely-serrate, glabrous, dull-green, coriaceous; *flowers* in axillary or terminal racemes, 1–4 in. long, the rhachis pubescent, numerous, small, 4–5-petalled, white; *fruit* a 2–3-valved capsule, $\frac{1}{5}$ in. long.

Distribution.—Abundant in lowland, montane, and subalpine forests from a little to the north of lat. 38° in North Island, southwards throughout South Island and Stewart Island.

FIG. 109.—*Weinmannia sylvicola* (Cunoniaceae).

TOWAI.

A medium-sized tree, 25–50 ft. high, with a persistent juvenile form having long, yellowish pinnate leaves, 4–5 in. long; *leaves* opposite, short-petioled, usually 3-foliolate but sometimes pinnate or even simple, the leaflets obovate-oblong, ovate-oblong, or lanceolate, 1–2 in. long, coarsely serrate, glabrous; *flowers* and *fruit* as for *W. racemosa*.

Distribution.—Common in forests from the north of North Island to perhaps somewhat south of lat. 37° or even farther south, but the exact distribution southwards not known.

Fig. 110.—*Wintera axillaris*—syn. *Drimys axillaris* (Winteraceae).

Horopito.

A small tree, 15–25 ft. high, or a tall shrub, the bark black; *leaves* alternate, short-petioled, elliptic-ovate or elliptic-oblong, 2–5 in. long, entire, glabrous, glossy dark-green, glaucous beneath; *flowers* in fascicles of 3–10 in the leaf-axils or from the scars of fallen leaves, small, 5–6-petalled, greenish-yellow; *fruit* a small, red, succulent berry containing 3–6 black, angular seeds.

Distribution.—In forests from Ahipara southwards in North Island, extending to Marlborough and Nelson to the north of the River Wairau in South Island.

FIG. 111.—*Wintera colorata*—syn. *Drimys colorata* (Winteraceae).

PEPPER-TREE.

A small tree, but more frequently a tall shrub, very similar to *W. axillaris*, but the leaves are shorter, conspicuously blotched red and yellow and more glaucous beneath, and the fascicles are usually only 2–4-flowered and the fruits more or less black.

Distribution.—In montane and subalpine forests of North Island from the Mamaku Plateau southwards, and throughout South Island and Stewart Island from the lowlands to the timber-line.

Species referred to in the Last Paragraph of Page 24.

(*a*) Tuft-trees belonging to the Genus *Cordyline* (Cabbage-trees) —Liliaceae.

Erect tuft-trees, or tuft-shrubs, having a naked trunk crowned by a large mass of very long, comparatively narrow, entire, glabrous, coriaceous leaves, and producing in great abundance small hermaphrodite flowers arranged in very large, much-branched, terminal panicles, the perianth 6-partite, the stamens 6, the ovary 3-celled, and the fruit a 3-celled, more or less succulent, small, globose berry.

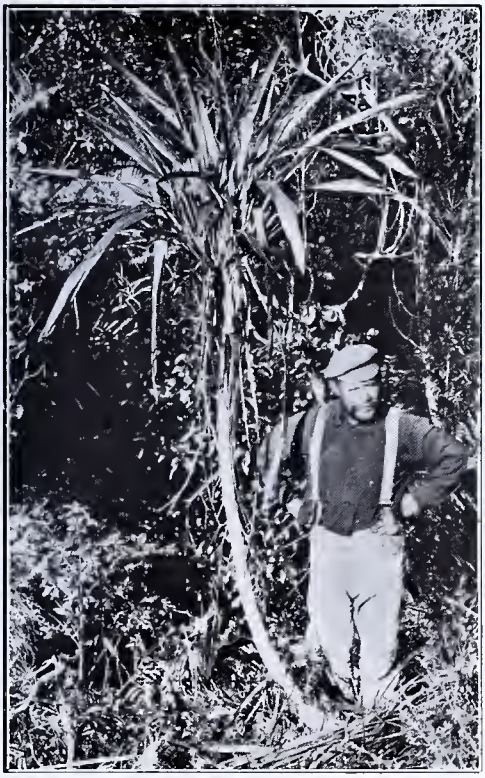

Fig. 112.—*Cordyline Banksii* as growing on the outskirts of the Waipoua Kauri Forest in 1907. [*Photo, L. Cockayne.*

* Leaves contracted into a petiole, 1–2 ft. long.

1. *Cordyline Banksii* (Ti-ngahere—fig. 112).

The *trunk* slender, unbranched or sparingly branched, occasionally 40 ft. high, but frequently almost wanting or only a

few feet long; *leaves* linear-lanceolate, 3–6 ft. long, their veins green, reddish, or yellowish; *panicles*, 2–5 ft. long, suberect or drooping, the *flowers* sessile or almost so, and the *berry* ½ in. diam. and white.

Distribution.—In the lowland and montane belts throughout North Island, more common on rocks and banks than in forest, extending in the lowland belt of South Island westwards to northern Westland.

FIG. 113.—*Cordyline indivisa* growing on the outskirts of the forest on Mount Hauhungatahi

[*Photo, L. Cockayne.*

** Leaves sessile, ensiform.

2. *Cordyline australis* (Ti, Cabbage-tree).

The *trunk*, 15–40 ft. high, 1–4 ft. diam., much-branched above in old trees, the bark rough and furrowed; *leaves* (of young trees) scattered along the stem, (of old trees) in a dense, rounded head, the leaves contracted just above the broad sheathing base, 1½–3 ft. long by 1½–2½ in. broad; *panicles* erect or drooping, the *flowers* white, luscious-scented, short-pedicelled; the *berry* white, ¼ in. diam.

Distribution.—In all three Islands, but very rare in Stewart Island, never in virgin forests, but in many habitats in the open with the substratum swamp to rock and ascending into the montane belt.

3. *Cordyline indivisa* (Toii, Broad-leaved Cabbage-tree—fig. 113).

The *trunk*, 5–25 ft. high, stout, rarely branched, bearing a great massive head; *leaves*, 2–6 ft. long by 4–6 in. broad at the middle, contracted below but again expanded at the sheathing base, greenish with a purplish or reddish tint above, glaucous beneath, the midrib and veins red or reddish-yellow; *panicle*, 2–4 ft. long, pendulous, the *flowers* short-pedicelled; the *berry*, $\frac{1}{4}$ in. diam., bluish-white.

Distribution.—In montane and subalpine forests of North Island, and in South Island on the east in the subalpine belt of Banks Peninsula and on the west in western Nelson southwards to the Otago fiords, where it occurs at sea-level.

(*b*) Tuft-trees belonging principally to the Genus *Dracophyllum*—(Epacridaceae).

* *Trunk* branched in candelabrum fashion; *flowers* in panicles; *leaves* crowded in rosettes at the tips of the branches, long, narrow, coriaceous, tapering to filiform points, recurved.

† Panicles terminal, large, 6–18 in. long.

1. *Dracophyllum latifolium* (Neinei, Spiderwood).

Trunk slender, 12–20 ft. high; *leaves* 10–18 in. long and 1–$1\frac{1}{2}$ in. wide at the base; *capsule* $\frac{1}{10}$ in. diam.

Distribution.—In lowland and montane forests from north of North Island to Hawke's Bay and Taranaki, and in South Island in western Nelson to some distance south of Westport.

2. *Dracophyllum Traversii* (Mountain-neinei—fig. 114).

Very similar to *D. latifolium* but *trunk* up to 30 ft. high and 2 ft. diam.; *leaves*, 1–2 ft. long by 1–2 in. wide at base, more rigid and reddish; and *capsule* $\frac{1}{8}$ in. diam.

Distribution.—In the upper subalpine forest and subalpine-scrub in western Nelson, southwards to southern Westland, where near the Franz Josef and Fox Glaciers it descends to the lowland belt, and probably farther south, but its distribution is not properly known.

FIG. 114.—*Dracophyllum Traversii* as growing in 1897 on old moraine, Arthur's Pass, at about 3,000 ft. altitude.

[*Photo, L. Cockayne.*

†† Panicle lateral, small.

3. *Dracophyllum Townsoni* (Slender-neinei).

Trunk 10–20 ft. high, the branches crowned with similar rosettes to those of *D. latifolium*, but not so large and made up of smaller leaves; *panicle* drooping, 2–3 in. long.

Distribution.—In the montane belt of the Paparoa Mountains, western Nelson.

** The nikau and the puka.

4. *Rhopalostylis sapida* (Nikau, Nikau-palm)—Palmaceae.

A tuft-tree, 10–25 ft. high, with a straight, green, smooth *trunk*, 6–9 in. diam., a crown of pinnate, sheathing *leaves*, 4–8 ft. long, the leaflets narrow-ensiform, 2–3 ft. long, the *inflorescence* a densely branched spadix enclosed in 2 boat-shaped spathes, the *flowers* monœcious; and the *fruit* an elliptic-oblong red drupe, ½ in. long.

Distribution.—In lowland forests throughout North Island, and in South Island as far as Banks Peninsula on the east, and to near Greymouth on the west.

5. *Meryta Sinclairii* (Puka)—Araliaceae.

A small, round-headed tree, 10–25 ft. high, with a *trunk*, 6–18 in. diam.; very large, oblong-ovate or oblong, smooth, shining, strongly-veined, coriaceous long-petioled *leaves*, the blade 10–20 in. long or more; diœcious *flowers* in stout, erect, terminal panicles, 6–18 in. long; and the *fruit* broadly-oblong, ⅓–½ in. long, 4–5-celled, succulent, and black.

Distribution.—The Three Kings Islands, and Hen and Chickens Islands.

(*c*) Tree-composites (Daisy-trees)—Compositae.

* Head solitary, large.

1. *Olearia angustifolia* (Teteaweka).

A round-headed tree, 10–15 ft. high, its branchlets, leaves beneath, and peduncles white with soft tomentum; with narrow-lanceolate, rigid, finely crenate-dentate *leaves*, 3–4 in. long, green and glossy above, and *flower-heads*, 1½–2 in. diam., with purple-disc and white-ray florets.

Distribution.—Shores of Stewart Island and in South Island in a few localities from the base of Bluff Hill westwards to Preservation Inlet.

** Heads small, panicled or corymbose.

† Leaves broad.

‡ Leaves entire.

2. *Olearia albida.*

Leaves oblong or ovate-oblong, 2–4 in. long, usually undulate, white beneath; *panicles* large with numerous heads of 3–6 florets.

Distribution.—On coast of North Island to somewhat south of lat. 38°.

3. *Olearia avicenniaefolia* (Mountain-akeake).

Leaves elliptic-lanceolate or oblong-lanceolate, 2–4 in. long, subacute, white- or buff-tomentose below; *corymbs* large, with numerous heads of 2–3 florets.

Distribution.—Lowland, montane, and subalpine belts of South Island, and rare in Stewart Island.

4. *Olearia furfuracea* (Akepiro).

Leaves oblong, broad-oblong, ovate-oblong, or broad-ovate, 2–4 in. long, obtuse, stiff, occasionally obscurely-toothed, silvery-tomentose, or brownish-tinged beneath; *corymbs* large, with many heads of 5–12 florets.

Distribution.—North Island, in lowland belt in the open southwards to Hawke's Bay and Taranaki.

5. *Senecio elaeagnifolius.*

Leaves more or less oblong, 2–3 in. long, covered beneath with buff tomentum as also the branchlets and inflorescence; *panicles* terminal, the florets without rays, yellowish.

Distribution.—In subalpine-scrub and subalpine forests of North Island and South Island generally, but rare in Stewart Island.

‡‡ Leaves toothed.

6. *Olearia arborescens* (Glossy Tree-daisy)—syn. *O. nitida.*

Leaves broadly ovate to elliptic-ovate, 2–3 in. long, white satiny tomentose beneath; *corymbs* very large, with numerous heads of 15–20 florets.

Distribution.—In subalpine belt of North Island from about lat. 38° southwards; common in South Island, descending on the west and south to sea-level; fairly common in Stewart Island.

†† Leaves narrow.

7. *Olearia ilicifolia* (Mountain-holly).

Leaves linear or linear-lanceolate, 2–3½ in. long, musk-scented if bruised, sharply serrate-dentate with hard, spinous teeth, whitish-green above, yellowish-white tomentose beneath; *corymbs* large, with many heads of 8–12 florets.

Distribution.—In subalpine belt of North Island and throughout South Island, descending on the west to the lowland belt; very rare in Stewart Island.

8. *Olearia lacunosa* (Lancewood Tree-daisy).

Branchlets, leaves beneath, petioles, and panicles densely rusty-tomentose; *leaves* narrow-linear to linear-lanceolate, 3–7 in. long, above dark-green and reticulated, beneath the surface is broken up into sunken interspaces bounded by the prominent veins and midrib; *panicles* large, with numerous heads of 8–12 florets.

Distribution.—From the subalpine belt of the Tararua Mountains, extending southwards in South Island, by way of western Nelson, to central Westland and sparsely in adjacent parts of western Canterbury.

*** Heads small, in glomerules, fascicled or solitary.

9. *Olearia lineata* (Weeping Tree-daisy).

Twigs slender, pendulous; *leaves* fascicled, narrow-linear, ½–1 in. long, the margins revolute, white-tomentose beneath; *heads* in few-flowered fascicles.

Distribution.—Common in Central Otago, South Island, but exact distribution elsewhere not known; very rare in Stewart Island.

10. *Olearia fragrantissima* (Fragrant Tree-daisy).

Erect, twiggy, the twigs zigzag; *leaves* elliptic-lanceolate to elliptic-oblong, acute, ¾–1 in. long, thin, silky tomentose beneath; *heads* of 4–8 florets in axillary, 8–12-headed, sessile glomerules, extremely fragrant.

Distribution.—In a few localities in South Island from Banks Peninsula southwards to Southland.

(*d*) Various small trees, but more frequently shrubs.

* Leafless, with small pea-like flowers.

1. *Chordospartium Stevensoni* (Weeping-broom)—Leguminosae.

Branches long, pendulous, slender, terete, green; *flowers* ⅓ in. long, purple; pod, indehiscent, ⅓ in. long.

Distribution.—As far as known, confined to the Avon Valley, and near the mouth of the River Clarence in Marlborough, South Island.

2. *Notospartium Carmichaeliae* (Pink-broom)—Leguminosae.

Branchlets compressed; *flowers* pink, the pedicles and calyx silky; *fruit* a curved, linear, 3–8-pointed pod, ⅓–⅔ in. long.

Distribution.—In the valleys of the Rivers Waihopai and Awatere and their tributaries in Marlborough.

3. *Notospartium glabrescens*—Leguminosae.

Apparently differs from *N. Carmichaliae* in its glabrous, purplish flowers and stouter, almost terete, straight pods, but more information is required before it can be definitely accepted as a species.

Distribution.—In the lower valley of the River Clarence and its tributaries in Marlborough.

4. *Notospartium torulosum*—Leguminosae.

Differs from the other species in its more open racemes and strongly torulose pod; *flowers* purple with almost glabrous pedicles and calyx.

Distribution.—From north-eastern Marlborough, South Island, to Mount Peel (Canterbury), but apparently only a few localities.

** With a 2-valved, woody capsule, the seeds embedded in a viscid fluid.

1. *Pittosporum Colensoi* and *P. fasciculatum*—Pittosporaceae.

Badly understood species which may be identical, closely related to large-leaved varieties of *P. tenuifolium*, but distinguished by the larger, coriaceous leaves with flat margins, and thick valves to the capsules. *P. fasciculatum* is supposed to differ from *P. Colensoi* only in the flowers being in fascicles.

Distribution.—Taking the two together, from the Mamaku Plateau, in North Island, southwards to Stewart Island, especially on the west of South Island.

2. *Pittosporum Dallii*—Pittosporaceae.

Leaves elliptic-lanceolate, sharply serrate, 2–4 in. long; *flowers* in terminal compound cymes, white, very fragrant.

Distribution.—Near Boulder Lake, north-west Nelson, South Island, at 3,500 ft. altitude.

3. *Pittosporum obcordatum*—Pittosporaceae.

Juvenile form long-persisting, made up of interlacing branchlets; *leaves* (adult) small, obcordate to almost orbicular, $\frac{1}{2}$–$\frac{3}{4}$ in. long.

Distribution.—In shallow swamps near Kaitaia and Wairoa North, North Island, and in South Island, at one time near Akaroa, but now probably extinct.

4. *Pittosporum patulum*—Pittosperaceae.

Juvenile leaves long-persisting, linear, 1–2 in. long, deeply lobed or pinnatifid and *adult* linear-oblong; *flowers* in 4–8-flowered umbels.

Distribution.—South Island, in subalpine forests of western Nelson, but rare; also at head of Lake Hawea, Canterbury.

5. *Pittosporum Turneri*—Pittosporaceae.

Juvenile form long-persisting, made up of interlacing branchlets, the *leaves* ranging from obovate-spathulate to linear-spathulate and from entire to toothed, lobed or pinnatifid ; the adult very similar to *P. patulum* in all its parts.

Distribution.—Limited to an area of a few acres on the bank of a stream to the west of the Waimarino Plain, volcanic plateau, North Island.

*** Flowers conspicuous, myrtle-like.

1. *Metrosideros Parkinsonii* (Slender-rata)—Myrtaceae.

Leaves more or less distichous, ovate-lanceolate to elliptic-ovate, 1–3 in. long ; *flowers* with numerous long stamens, bright crimson.

Distribution.—Great Barrier Island in subalpine forest, and western Nelson in South Island.

2. *Myrtus obcordata* (Rohutu)—Myrtaceae.

Leaves obcordate, $\frac{1}{5}$–$\frac{1}{2}$ in. long ; *flowers* solitary, axillary, $\frac{1}{4}$ in. diam., white, the peduncle $\frac{1}{4}$ in. long, pubescent ; *berry* dark-red, $\frac{1}{4}$ in. long.

Distribution.—Throughout lowland forests of North Island and South Island, but only known north of lat. 36° near Hokianga and Ahipara.

**** Flowers inconspicuous.

1. *Coprosma rotundifolia* (Round-leaved Coprosma)—Rubiaceae.

Leaves opposite, more or less orbicular, long-pointed, $\frac{1}{4}$–$\frac{3}{4}$ in. long, thin, pubescent, ciliate ; *flowers* diœcious ; *drupe* globose, $\frac{1}{6}$ in. diam., red, containing 2 plano-convex stones.

Distribution.—In lowland forest in the three Islands, but a true tree on river-bed forest of Westland where it forms pure stands.

2. *Melicope simplex* (Poataniwha)—Rutaceae.

Leaves rhomboid-obovate, $\frac{1}{2}$–$\frac{3}{4}$ in. long, jointed to the flat or narrowly-winged petiole ; *fruit* a coccus with black protruding seeds when ripe.

Distribution.—In lowland forests and sometimes shrubland, or scrubs, throughout North Island and South Island.

3. *Olea apetala* (Broad-leaved Maire)—Oleaceae.

Differs from the other New Zealand species of *Olea* in the juvenile leaves being longer and broader than the adult and in the adult leaves being broader than those of the other three species already described ;

leaves (adult) elliptic-oblong or elliptic-ovate, $1\frac{1}{2}$–3 in. long; *flowers* without petals; *fruit* an oblong, red drupe, $\frac{1}{3}$ in. long.

Distribution.—On the islands lying to the east of Auckland, and near Whangarei, North Island. It may be identical with the Norfolk Island species of the same name.

4. *Suttonia montana*—Myrsinaceae.

Branchlets more or less drooping; *leaves* alternate, narrow obovate, $\frac{3}{4}$–1 in. long, emarginate or obtuse, glandular-dotted; *flowers* in 2–5-flowered fascicles on the branches below the leaves, $\frac{1}{8}$ in. diam.; *fruit* globose, $\frac{1}{10}$ in. diam., 1-seeded; (very close to the widely-distributed *S. divaricata*—a shrub with interlaced twigs which also sometimes droop).

Distribution.—Local and rare, extending southwards from Hawke's Bay, North Island, to near Westport in South Island.

Hybridism in the Forest Flora.

When attempting to find out the name of any plant by means of a botanical description or even by comparison with a figure it not infrequently happens that, although the plant corresponds more or less to the description, some essential characters are lacking or but indifferently represented. Also, the plant in question may look like an intermediate form between two distinct species. In the latter case **hybridism** may at once be suspected, and in the former either hybridism or that kind of alteration—known as **epharmonic**—due to the plant growing under conditions markedly different from those of its customary dwelling-place.

This matter of **hybridism** in the New Zealand flora has received a good deal of attention during the last six years, and the accepted dicta of floras have been so greatly upset that many supposedly good species are now known to be merely hybrids, and that so-called "variable species" are not variable at all, their alleged forms being the result of hybridism and epharmony—one or both. Taking the New Zealand vascular flora as a whole, no less than three hundred groups of wild hybrids are now known, while most of these groups do not consist of merely one or two individuals, but of highly polymorphic **hybrid swarms.** This knowledge is not based on guesswork or on the examination of the herbarium material, but on intensive studies of living plants in the field, supported by garden culture, the sowing of seeds of suspected hybrids and seedlings of diverse characters resulting, and the actual synthesis of certain hybrids by

crossing the reputed parents. The following is a list of all the hybrid swarms noted up to the present in which the trees described in this chapter are concerned.

FIG. 115.—A and B are leaves of *Aristotelia serrata* and *A. fruticosa* respectively; the remaining twelve leaves are each taken from a different hybrid between the two species. [*Photo, S. Gibson.*

1. *Aristotelia fruticosa* (divaricating shrub) × *serrata* (small tree) = × *Aristotelia fruserrata* Ckn. et Allan (fig. 115).

   Aristotelia Colensoi Hook. f. is not a species, but one of the hybrids intermediate in characters between the parents.

2. *Coprosma grandifolia* × *lucida*.
3. *Coprosma grandifolia* × *tenuifolia*.

4. *Coprosma robusta* (bushy tree or shrub) × *propinqua* (divaricating shrub) = × *Coprosma prorobusta* Ckn. et Allan.

Coprosma Cunninghamii Hook. f. is not a species, but one of the hybrids intermediate between the parents.

5. *Cordyline australis* × *Banksii.*
6. *Cordyline australis* (tuft-tree) × *pumilio* (tuft-shrub).
7. *Dracophyllum longifolium* (fastigiate tree or shrub) × various species of the genus.
8. *Edwardsia microphylla* (small tree) × *prostrata* (divaricating) shrub).

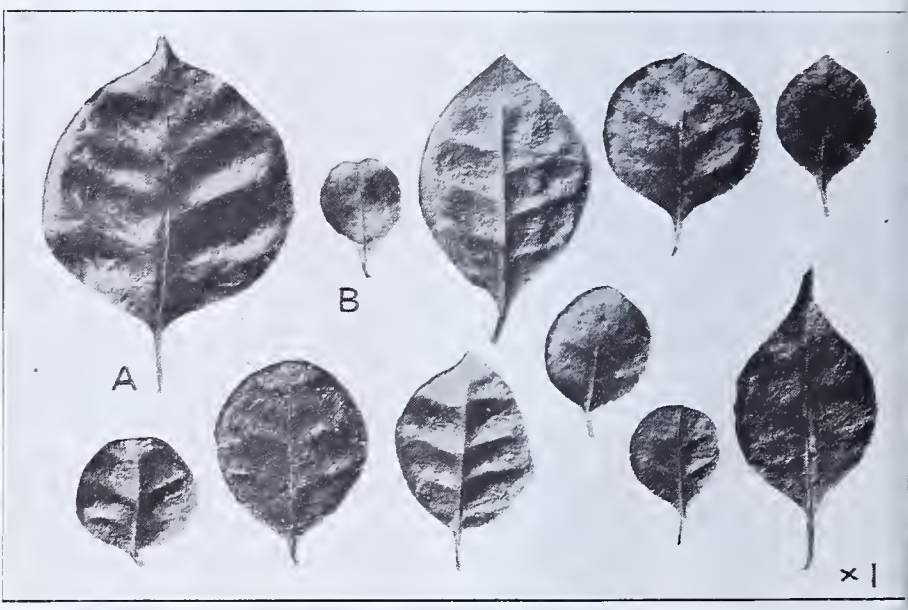

FIG. 116.—A and B are leaves of *Myrtus bullata* and *M. obcordata* respectively; the remaining nine leaves are each taken from a different hybrid between these two species, and they belong to the hybrid swarm × *Myrtus bullobcordata.* [*Photo, S. Gibson.*

9. *Fuchsia excorticata* (small tree) × *perscandens* (scrambling liane).

Fuchsia Colensoi Hook. f. is either a small group of the hybrids or a shrub resembling a hybrid.

10. *Hoheria angustifolia* × *sexstylosa.*
11. *Hoheria angustifolia* × *Lyallii.*

Each belongs to a subgenus and until recently has been considered to belong to different genera. *Gaya Allanii* Ckn. is not a species, but one of these hybrids.

12. *Leptospermum ericoides* × *scoparium.*

13. *Melicope simplex* (divaricating shrub) × *ternata* (small tree) = × *Melicope tersimplex* Allan.

Melicope Mantelli Buch. is not a species, but a small group of the hybrids.

14. *Metrosideros robusta* × *tomentosa*.

15. *Mida myrtifolia* × *salicifolia*.

Apparently *M. eucalyptoides* A. Cunn. is not a species, but one of the hybrids intermediate between the parents.

16. *Myrtus bullata* (tree or shrub) × *obcordata* (bushy shrub) = × *Myrtus bullobcordata* Allan (fig. 116).

Myrtus Ralphii Hook. f. is not a species, but a small group of the hybrids intermediate between the parents.

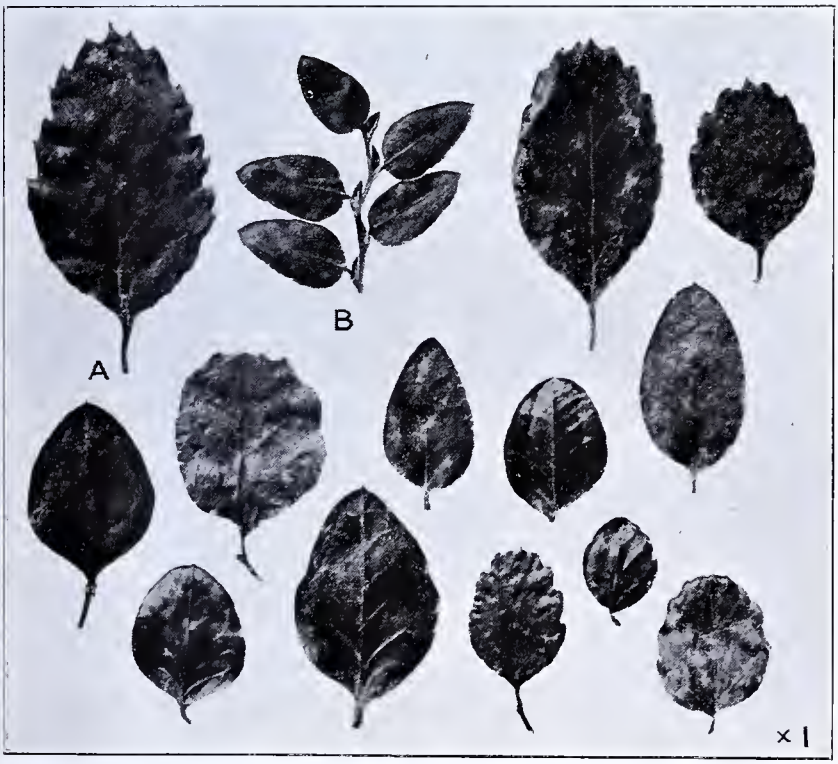

FIG. 117.—A and B are leaves of *Nothofagus fusca* and *N. cliffortioides* respectively; the remaining twelve leaves are each taken from a different hybrid between the two, and represent a small part of the hybrid swarm × *Nothofagus cliffusca*.

[*Photo, S. Gibson.*

17. *Nothofagus cliffortioides* × *fusca* = × *Nothofagus cliffusca* Ckn. (fig. 117).

Nothofagus Blairii T. Kirk is not a species, but a group of the hybrids with entire margins.

18. *Nothofagus cliffortioides* × *Solandri*.
19. *Nothofagus Solandri* × *fusca*.
20. *Nothofagus Solandri* × *truncata* = × *Nothofagus soltruncata* Ckn. (fig. 118).

Nothofagus apiculata Col. is not a species, but one of the hybrids with an entire margin.

21. *Nothofagus fusca* × *truncata*.

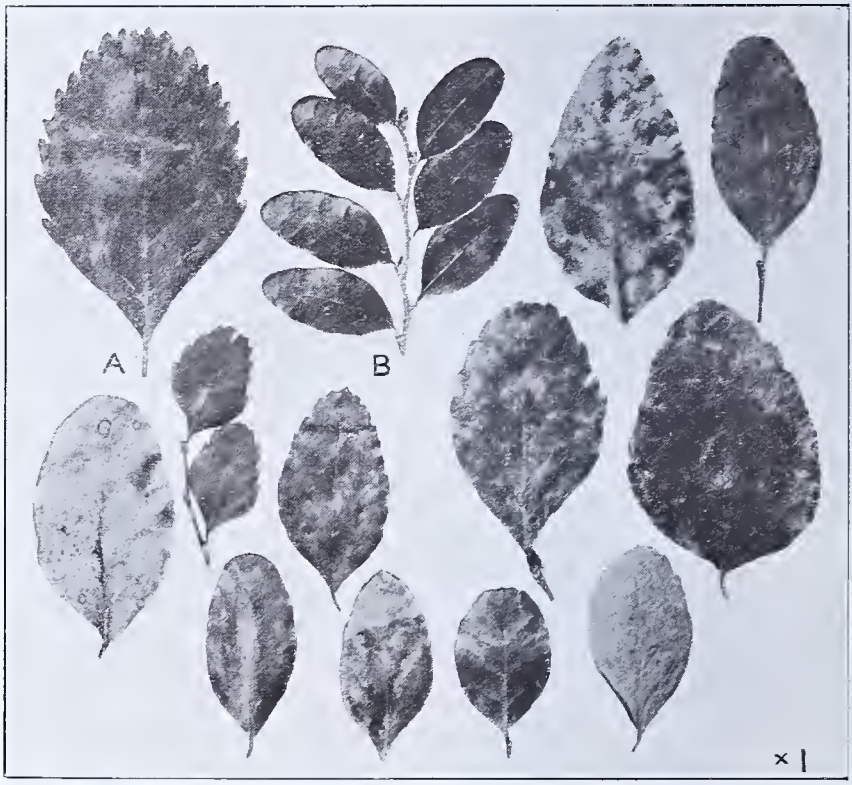

FIG. 118.—A and B are leaves of *Nothofagus truncata* and *N. Solandri* respectively; the remaining eleven leaves are each taken from a different hybrid between the two, and represent a small part of the hybrid swarm × *Nothofagus soltruncata*.

[*Photo, S. Gibson.*

22. *Nothopanax anomalum* (divaricating-shrub) × *simplex* (dimorphic tree).

Nothopanax parvum Ckn. is not a species, but one or more of the hybrids about intermediate in characters between the parents.

23. *Nothopanax arboreum* × *Pseudopanax crassifolium* var. *unifoliolatum.*
24. *Nothopanax Colensoi* × *simplex.* *N. McIntyrei* Cheesem. is not a species, but one of these hybrids.
25. *Olearia angustifolia* × *Colensoi.*

    An intermediate form has been treated as a species and described as *O. Traillii* T. Kirk.
26. *Olearia arborescens* × *avicenniaefolia.*
27. *Olearia arborescens* × *capillaris.*
28. *Olearia arborescens* × *ilicifolia.*

    O. macrodonta Hook. f. represents in part this polymorphic swarm.
29. *Olearia arborescens* × *lacunosa.*

    O. excorticata Buch. is not a species, but one or more of the hybrids intermediate between the parents.
30. *Olearia avicenniaefolia* × *ilicifolia.*
31. *Olearia avicenniaefolia* × *moschata.*
32. *Olearia ilicifolia* × *lacunosa.*

    O. suavis Cheesem. is merely a small group of the swarm, and not a species, and so, too, *O mollis* Ckn.
33. *Olearia ilicifolia* × *moschata.*
34. *Paratrophis opaca* × *microphylla.*
35. *Plagianthus betulinus* (low tree) × *divaricatus* (divaricating-shrub).

    P. cymosus T. Kirk is based on one or two individuals of the hybrid swarm, and so is not a species.
36. *Podocarpus acutifolius* × *nivalis.*
37. *Podocarpus Hallii* (lofty tree) × *nivalis* (prostrate shrub).
38. *Podocarpus Hallii* × *totara.*
39. *Quintinia acutifolia* × *serrata.*
40. *Shawia coriacea* (shrub) × *paniculata* (tree or tall shrub).
41. *Wintera axillaris* × *colorata.*

The question of **epharmony** is far too wide for detailed discussion here. The student must understand, however, that, though two plants growing under different surroundings may look quite distinct from one another, they may belong to the same species, for when grown under identical conditions in time they will become identical in their characters. Thus the small shrubby pohutukawa of Rangitoto Island, a foot or two high, yet blooming freely, is *Metrosideros tomentosa* equally with the massive tree of that name. Differences of stature ; in density of branching ; in size, shape, texture, and hairiness of leaves ; in number, size, modification of floral organs, and period of blossoming—

all these and many other modifications may be purely epharmonic. Further, specimens taken from an individual tree may be so different that, were their origin not known, each would certainly be referred to a different species. Thus leaves of *Nothofagus fusca* taken from the periphery of the crown of the tree in no wise resemble leaves gathered from low down—the easiest place to collect them—and considered "typical." So, too, according to the intensity of the light which reaches them, leaves of *Nothofagus cliffortioides* or *N. Solandri* may be tomentose beneath or glabrous.

Bearing in mind the facts relating to hybridism and epharmony, it can readily be seen that there is no royal road for the determination of species, but that most careful observations based on experience are required, and that, in no few instances, cultural experiments will alone clear up doubtful points. Were all easy and stereotyped there would be little interest in the identification of plants, but since so much is required of the collector this preliminary—finding the names of plants—to more serious botanical study becomes a fascinating pursuit.

CHAPTER III.—THE TIMBERS.

In dealing with the uses to which New Zealand timbers could be put, it has been customary to assign a value of some kind to the wood of almost any tree irrespective of the size of the tree, its relative abundance, or its profitable commercial use. This has arisen in part from the fact that in the early days of colonization timbers of all kinds taken from trees growing near their dwellings were used by the settlers, since each man was perforce his own carpenter. Somewhat later, too, it was the fashion to employ the wood of many small or rare trees for decorative purposes within the home or for fancy pieces of furniture, while at one time small tables and so-called "ornamental" woodwork were constructed in patchwork fashion of highly-polished small pieces of as many different kinds of wood as could be procured. This cult has passed away, so that now only those trees are converted into timber which will yield a profit. Further, though there are many trees well suited for furniture and decorative purposes, they are present in the forests in such limited quantity and are frequently so small as to prohibit their use. In what follows, then, only those timbers are dealt with for which there is some demand, together with a few others the use of which should perhaps be encouraged. Probably we err in speaking of too many rather than of too few. But, as the supply of the high-class timbers reaches the vanishing-point, the best of those now neglected must come into general use, and also novel uses for certain neglected trees may well be expected. Above all, in the latter respect, the conversion into pulp of various trees seems highly probable, in which case the indigenous forests will assume a new aspect from the standpoint of commercial forestry.

The following, presented in alphabetical order, is a list of the trees of commercial value, together with a few others of minor importance, and brief statements are given as to the leading uses to which their timbers can be put.

1. *Agathis australis* (Kauri).

The timber is light yellowish-brown in colour; it is straight in the grain, strong, easily worked, and remarkably free from knots and defects; probably there is no more generally useful softwood in the world. Though formerly much used for house-building, its present high price confines its use to such purposes as railway-carriage building, cabinet and general joinery. Mottled and figured kauri is much prized for cabinet-work. The kauri yields a very valuable resin called kauri-gum.

2. *Beilschmiedia taraire* (Taraire).

The timber is light-brown in colour, straight in the grain, easily worked, and somewhat resembles plain oak in appearance. It has a limited use for furniture-making and picture-mouldings, but with preservative treatment its use could be much extended.

3. *Beilschmiedia tawa* (Tawa).

This tree is far more important than *B. taraire*, since it is much more abundant; but both trees have the important characteristic of gradually dominating the forest where they occur and turning it into pure tawa or taraire forest, as the case may be, which is a long-persisting climax-association (fig. 5.) The timber is light-brown in colour, rather hard, straight in the grain, but somewhat brittle. At present it is used to a small extent for inside lining (especially floors and ceilings), and packing-cases, but with preservative treatment its use could be much extended. A serious defect is the difficulty with which nails can be driven into the wood. In the days before the present dairy factories the timber was used extensively for butter-kegs, the chief milling-area being in the locality of the Marlborough Sounds. It is now definitely known that the timber of this tree is valuable for wood-pulp manufacture.

4. *Dacrydium Colensoi* (Silver-pine) and *D. intermedium* (Yellow Silver-pine).

We take these two species together partly because the timbers are apparently of much the same character and suitable for much the same purposes, and partly because there appears to be a good deal of doubt as to which of the two is spoken of as "silver-pine" in certain localities; nor is it certain that *D. Colensoi* of the north of North Island is identical with the tree of the volcanic plateau or of South Island.

Taking what we consider the silver-pine (*D. Colensoi*) the timber is whitish when first cut, darkening to a light yellowish-brown; it

is straight in the grain and easy to work. Owing to its extreme durability it has been used mainly for railway-sleepers, telegraph-poles, and posts; it is occasionally beautifully mottled, and is then used for cabinet-work. The remaining supplies are now very limited, but where it has been felled in Westland it reinstates itself in abundance, forming, in places, almost pure stands, which, although the tree is apparently of very slow growth, will in time become of sufficient size for milling; while, as the ground is worthless where it grows, the cost of its natural production is nil.

The yellow silver-pine is frequently too small a tree for commercial purposes—*e.g.*, on the west of Stewart Island, where it forms an almost pure association. According to T. Kirk, who describes the wood as "reddish-yellow, resinous, straight in the grain, firm, compact, and even, of great strength and durability," it may be applied to the same purposes as *D. Colensoi*, and it "is reputed to be of even greater durability." From this it seems that Kirk, like ourselves, did not really know anything *for certain* concerning the differences between the timbers of the two species.

5. *Dacrydium cupressinum* (Rimu).

This, at the present time, is the principal indigenous timber-tree of the Dominion, so far as its being milled is concerned, but year by year its output must gradually decrease. The timber when first cut is reddish-brown, which changes when seasoned to a light brown with darker and lighter streaks. It is fairly straight in the grain, and easily worked. It is the chief timber used in house-building, but it cannot be employed in contact with the ground. It is often beautifully figured, and such timber is used for furniture, doors, and panelling.

6. *Dodonaea viscosa* (Akeake).

The timber is really of no commercial value, but it is of some historic interest, since, being extremely heavy and extremely hard, it was used by the Maori for making clubs and spears. The heart-wood is reddish, variegated with patches or streaks of yellow, and so lends itself for the purpose of making picture-frames and ornamental wooden articles.

7. *Dysoxylum spectabile* (Kohekohe).

The timber is reddish in colour, rather soft, but strong and tough, very ornamental, and easily worked. It much resembles Honduras mahogany, and could be used for the same purposes. Unfortunately, kohekohe is not now found in large quantities, and the tree also suffers from "heart-rot."

8. *Edwardsia microphylla* and *E. chathamica* (Kowhai).

The timber is pale brown, dense, heavy, strong, tough, and elastic. It lasts well in the ground, and so is suitable for fencing-posts and small piles. However, trees are not in sufficient numbers to be commercially important, and, at best, have a limited local use.

9. *Elaeocarpus dentatus* (Hinau).

The sapwood is white and the heartwood is dark brown; it is heavy, very strong, tough, and durable. The trees are very often hollow, and are seldom milled. Owing to the great durability of the heart timber it is much used for fencing-posts.

10. *Fuchsia excorticata* (Tree-fuchsia).

Unfortunately, the trunk, though massive enough, is generally too irregular to be of much use. The wood is deep brown with pale streaks and narrow waved black markings; it is hard, dense, compact, and even. It stands well in the ground, and is suitable for house-blocks and fencing. It is useless as firewood, even when quite dry.

11. *Griselinia littoralis* (Broadleaf).

The irregular trunk greatly detracts from the value of the timber, otherwise its extreme durability fits it for all those uses which timber possesses that can last for a long time in the ground. The wood is pale reddish-brown with faint markings.

12. *Knightia excelsa* (Rewarewa).

The timber is yellowish-brown; when cut on the quarter the medullary rays show as reddish-brown splashes and the timber is then extremely handsome. It is very strong, tough, and elastic. Its chief use is for cabinet-work, ornamental turnery, and inlaid work, and its employment in these directions might be much extended. The long straight trunk enhances its worth as a commercial tree, and assuredly, as time goes on, its timber will be considered of especial value.

13. *Laurelia novae-zelandiae* (Pukatea).

The wood of the pukatea is pale brown in colour, often with darker or paler streaks, and frequently very ornamental. Though soft, it is strong, very tough, light, difficult to split, and takes a fine finish. In the ground it is of uncertain durability, but it is durable out of the ground. It is a timber which has been much neglected, having been used only to a small extent for boatbuilding, weatherboards, furniture, and posts in sandy land.

14. *Leptospermum ericoides* (White Tea-tree) and *L. scoparium* (Manuka).

The wood of *L. ericoides* is light brown, dense, heavy, straight-grained, hard, very strong, tough, and elastic. Owing to its exceptionally good burning qualities it has been extensively used for fuel, but settlers and miners have made considerable use of it for handles of axes, picks, bill-hooks, &c. It makes good wheel-spokes.

Manuka proper (*L. scoparium*) is usually too small for any other use than as firewood, and for this important purpose it is excellent and the supply is considerable and can easily be increased.

15. *Libocedrus Bidwillii* (Kaikawaka).

The timber is dark red in colour, easy to work, light, and rather weak; it has considerable resemblance to totara, but it is not so strong, and generally not so durable. The timber has been used for telegraph-poles, shingles, palings, and show-cases, and, with the lessened supply of totara, its use for these purposes will increase. Being difficult to burn, it is specified for the construction of fire-proof doors. Unfortunately, though occurring over a wide area, it is limited in quantity, and if used freely the supply would soon be exhausted.

16. *Litsaea calicaris* (Mangeao).

The timber is light brown in colour, tough, strong, and of great elasticity, and of about the same weight as English ash. It is used in coach and railway-carriage building and for ship's blocks, and only its scarcity prevents its wider use.

17. *Metrosideros lucida* (Southern-rata) and *M. robusta* (Northern-rata).

The timber of both these trees is reddish-brown in colour, extremely hard, heavy, strong, and (out of the ground) very durable; it is highly valued as firewood, but is also used to a small extent for cross-arms for telegraph-poles and for wheelwright's work. Its use could be much extended.

18. *Metrosideros tomentosa* (Pohutukawa).

The wood is dark red, dense, heavy, compact, and very durable. Its tortuous habit of growth makes it of value for ship-timbers, and for this purpose it has been employed extensively since the early days of settlement. It is suitable for use when exposed to salt water, since it is immune to the attack of the teredo. Like the other species of the genus, it makes excellent firewood.

19. The various species of *Nothofagus* (Beeches).

There are no timbers which have given rise to so much discussion as those of the New Zealand beeches, some praising them highly and others—a majority—condemning them *in toto*. This state of affairs is due to various causes. In the first place, each of the species bears such a multiplicity of common names, while most of these names are applied indifferently to all the species, that people—some botanists excepted—who come from different localities, when discussing the merits or demerits of a particular tree, are most likely each talking about a different species. Even by all botanists, until quite recently, the species were imperfectly understood, chiefly through the extraordinary abundance of hybrids and through two groups of such masquerading as good species. In the second place, for many years there has been abundance of high-class timbers, so that beech timber has not been wanted, and when occasionally used it has not been seasoned and has frequently warped badly.

Notwithstanding prejudices and misunderstandings, the timber of *Nothofagus* is slowly but surely coming into its own, and there can be little, if any, doubt that in her beech forests New Zealand possesses a source of perennial wealth, since all the species regenerate freely and fairly rapidly after milling, and this operation need not spell destruction as in the case of rain-forest proper. As for the uses of the timber of each species, something fairly definite is now known, thanks, in part, to the employment of beech timber for building purposes forty to sixty years ago and even longer, and partly by the rather wide use which is being made of *Nothofagus Menziesii* at the present time, this tree being milled extensively in Southland. Each of the species produces a timber more or less distinct from that of the others, so the timber of each species must be discussed separately.

(*a.*) Taking that of *Nothofagus Menziesii* (Silver-beech) first of all, it is of a pinkish colour when first cut, but with exposure it changes to a light brown. It is straight in the grain, easily worked, strong, and about the same weight as the common ash (*Fraxinus excelsior*). It is extensively used for furniture of many kinds, but especially chairs, and also for bent woodwork, billiard-tables, bodies of motor-cars, agricultural implements, box-timber, clothes-pegs, and it is being tried for wine-casks. As a building-timber its main drawback is that it cannot be employed in contact with the ground. Already there is a considerable trade with Australia. At present it is milled almost exclusively in Southland, but it is only a matter of time and it will be milled throughout its range. It possesses a great advantage over the other species of *Nothofagus*, since the tree is far less subject to fungus attack.

(*b*) *Nothofagus fusca* (red-beech) as a timber is deep-red when first cut, but it turns eventually to a light brown. It is hard, strong, easily split, durable even when in close contact with the ground, and its weight much the same as that of *N. Menziesii*. At the time of gold-mining in Otago the timber was in regular use for house-building, so that much of the Town of Queenstown and neighbouring villages is built of red-beech, mixed probably with silver-beech. Unless properly seasoned the timber warps badly, but to what extent this is due to improper stacking we cannot say. That when properly seasoned it does not warp at all seems to be the case. Thus one of us has seen a large show-case in a draper's shop which was constructed of *Nothofagus fusca*, except the back, which was *Libocedrus Bidwillii*. After seven years' constant use the numerous drawers fitted perfectly, nor had a pane of glass—and the front was mainly glass—been broken through the wood warping. So, too, the maker of this piece of furniture had made an excellent violin from red-beech timber. At the present time red-beech is being used for furniture, bent woodwork, stringers for bridges, floors of railway-trucks, mine-props, and fencing-posts. It has been employed for house-building and railway-sleepers—some recorded were sound after twenty-five years' use—but as various beeches have been used indiscriminately any evidence against *N. fusca* sleepers is of little moment. Undoubtedly the timber of *N. fusca* is of great value, and it could quite well be substituted in large part for imported *Eucalyptus* timber.

(*c*) *Nothofagus truncata* (hard-beech) has only been recognized quite recently as distinct from *N. fusca*. Its timber is apparently still more durable, and it can be used for the same purposes as that of *N. fusca*. The relative hardness of the two timbers may be gauged from the fact that the saw becomes blunt far more rapidly when cutting *N. truncata* than when cutting *N. fusca*. When first cut the timber of *N. truncata* is pink in colour.

(*d*) Concerning the timber of *Nothofagus Solandri* (black-beech) the evidence is highly contradictory, owing principally to the fact that it has again and again been confused with that of *N. cliffortioides*. For instance, nearly all, if not all, the trees milled in Southland and Otago considered to be *N. Solandri* have been *N. cliffortioides*. At present very little use is being made of the timber except for fencing-posts and firewood. But at one time it was employed for house-building, for railway-sleepers, and for fencing-posts, though doubtless, so far as Oxford (Canterbury)—the chief seat of its conversion into timber—was concerned, not only would *N. Solandri* be used, but also *N. cliffortioides* and hybrids between the two. Probably the timber of *N. Solandri* is fairly durable when in the ground, and suitable for rough buildings, fencing-posts, and box-timber, to say the very least.

(*e*) *Nothofagus cliffortioides* (mountain-beech) is of little value as a timber, for it decays rapidly. However, it is of importance for box-timber and for second-class firewood. Where growing in company with *N. Solandri* the two may readily be mistaken for one another.

20. *Olea Cunninghami* (Black-maire).

The wood is light brown, often with dark streaks, and bears considerable resemblance to that of its relative, the European olive. It is extremely dense, heavy, hard, strong, and (out of the ground) durable ; it has been used to a small extent for framing for machinery and for bridge-building, but owing to its exceptional heat-giving property its chief use has been for firewood. It is quite suitable for all those turnery purposes for which the wood of the European olive is employed.

21. *Phyllocladus trichomanoides* (Tanekaha).

The timber is yellowish-white, free from knots, close-grained dense, heavy, and very strong, and shrinks but little in seasoning, It is of uncertain durability in the ground, but is very durable out of the ground. In the past it was used for bridge-building, sleepers, and mine-props. It is now employed in railway-carriage construction. The bark is very valuable, containing as much as 28 per cent. of tannin. The species, though widespread, is rarely abundant, and if its timber were in demand it would soon be exhausted.

22. *Podocarpus dacrydioides* (Kahikatea).

The sapwood, which comprises the greater part of the log, is white, and the heartwood yellow. The timber is straight in the grain, easily worked, and long clean lengths can be obtained. The yellow heartwood is durable, but the sapwood is very susceptible to the attacks of the larvae of the white-pine borer, and on this account is no longer employed for house-building. The timber is inodorous, and is used mainly for butter-boxes, cheese-crates, and other packages.

23. *Podocarpus ferrugineus* (Miro).

The heartwood is brownish in colour, very fine in the grain, easily worked, and of exceptional strength, though not durable in the ground. The timber is used in house-building, and is often sold as rimu, to which it bears considerable resemblance.

24. *Podocarpus spicatus* (Matai).

The timber is light yellowish-brown in colour, straight in the grain, easily worked, but somewhat brittle and rather heavy. In the

ground it is of second-rate durability, but it is very durable out of the ground. It is used chiefly for weatherboarding and flooring.

25. *Podocarpus totara* (Totara) and *P. Hallii* (Thin-bark Totara).

These two trees are even yet badly known botanically, owing probably to the existence of many hybrids between them, and, also, there may be more than one true-breeding variety of either species. Commercially no distinction is made between the timber of the species. Taking, however, *P. totara* proper, the timber is reddish when first cut, seasoning to a reddish-brown. It is straight in the grain, easily worked, but somewhat brittle. Its great durability has caused it to be much employed for railway-sleepers, wharf-piles, telegraph-poles, and posts. Its high price and its freedom from warping and shrinking are now, however, causing it to be made use of for such special purposes as window and door frames ; it is also much used for veranda-posts, flooring, and steps.

26. *Vitex lucens* (Puriri).

The timber when seasoned is a dark rich brown ; it is extremely hard, dense, strong, durable, and heavy. Owing to its interlaced fibres it is difficult to work. It has been so much used for railway-sleepers, posts, and house-blocks that the supply is now almost exhausted.

27. *Weinmannia racemosa* (Kamahi).

The timber is dark brown or reddish in colour, and often has dark streaks running through it ; it is strong and tough, but rather irregular in the grain ; when worked up it has a very handsome appearance, but it is difficult to season without warping and cracking. At present it is employed to a limited extent only as rails for forest tram-lines, but owing to its abundance it has considerable possibilities, and may eventually be found suitable for the manufacture of wood-pulp.

APPENDIX.

GLOSSARY.

(*a*) TAXONOMIC.

ACHENE. A small one-seeded, dry, indehiscent, seed-like fruit.
ACUMINATE. Drawn out into a long point; especially applied to the tip of a leaf.
ACUTE. Sharp-pointed.
ALTERNATE. Applied to leaves which follow one another on the opposite sides of the stem.
ANTHER. That part of the stamen containing the pollen.
APEX. The tip or summit of any organ.
APICAL. At the apex.
APPRESSED, ADPRESSED. Pressed close to any part of a plant, as leaves to the stem.
AXIL. The upper angle at the junction of the stem and leaf.
AXILLARY. Placed in the axil of a leaf.
BERRY. A pulpy fruit, usually containing many seeds.
BLADE. The expanded portion of a leaf.
BRACT. A modified leaf growing on a flower-stalk.
BRANCHLET. A small branch; the ultimate division of a branch.
CALYX. The outer whorl (ring) of floral leaves of a flower; the leaves themselves are called sepals.
CALYX-TUBE. The lower united portion of the calyx-leaves; but frequently the leaves (sepals) are not united.
CAPITATE. Having a knob at the end, like the head of a pin; growing in heads or close clusters.
CAPSULE. A dry, many-seeded seed-vessel.
CARPEL. A simple pistil, or one of the parts (leaves) of which a compound pistil is composed.
CATKIN. A deciduous, unisexual spike of crowded flowers in which the perianth is replaced by bracts.
CELL. A cavity in any structure—*e.g.*, in an ovary or anther; an elementary organ composed of protoplasm, containing a nucleus and usually enclosed by a wall of cellulose.
CLADODE. A flattened branchlet resembling a leaf and functioning as such.
CONIFER. One of the *Coniferae*.
COCCUS (pl. COCCI). One of the parts into which a lobed fruit with 1-seeded cells splits.
CORDATE. Heart-shaped.
CORIACEOUS. Resembling leather in texture, but used in a rather wide sense.
COROLLA. The whorl of floral leaves between the calyx and the stamens.
CORYMB. A flat-topped or convex open inflorescence with a short axis and the flowers opening from the margin inwards.
CORYMBOSE. In the form of a corymb, or like a corymb.

CRENATE. With rounded, marginal teeth. When these teeth are again rounded the margin is doubly crenate.

CUNEATE. Wedge-shaped; triangular with the apex downwards. Often applied to the base of a leaf.

CUTICLE. The outermost skin or epidermis.

CYME. A broad rather flat inflorescence which flowers from the centre outwards.

DECIDUOUS. Falling off after a time, not evergreen.

DEHISCENT. Which splits open.

DELTOID. Shaped like the Greek letter Δ.

DENTATE. Toothed with the teeth pointing straight outwards; as opposed to serrate, in which they point to the extremity of the organ.

DICHOTOMOUS. Repeatedly forked by pairs.

DIGITATE. Branched after the manner of fingers when spread out. A digitate leaf is a compound leaf with the leaflets spread out from the top of the leaf-stalk (petiole).

DIGITATELY. In a digitate manner.

DIMORPHIC. Having two distinct forms.

DIŒCIOUS. Having the male and female flowers on different individuals.

DISTICHOUS. Arranged in two rows.

DRUPACEOUS. Drupe-like.

DRUPE. A fleshy or succulent fruit (*e.g.*, a plum) with the seed enclosed in a hard and bony casing; a "stone-fruit"; but many drupes are quite small, and so unlike the ordinary conception of such a fruit, and a few contain more than one stone (*e.g.*, *Coprosma*).

ELLIPTIC, ELLIPTICAL. Having the form of an ellipse; oblong with regularly rounded ends.

EMARGINATE. Slightly notched at the end.

ENDEMIC. Confined to a particular country or region.

ENTIRE. Having an even margin, without teeth or divisions of any kind.

EXOTIC. Foreign; not native.

EXSERTED. Prolonged past surrounding organs—*e.g.*, stamens beyond the corolla.

FALCATE. Bent like a scythe or sickle.

FAMILY. A group of more or less closely related genera; formerly termed a natural order.

FASCICLE. A dense cluster, usually small.

FASCICLED. Borne in dense clusters.

FASTIGIATE. With the stems and branches nearly erect and close together.

FEMALE. A plant with only pistillate flowers, or a pistillate flower.

FLEXUOUS. Bent alternately in opposite directions; zigzag.

FLORET. A single small flower in a compact inflorescence, especially in the flower-head of the *Compositae*.

FLORISTIC. Relating to the flora, in contrast to ecological, which means relating to the vegetation and life-forms.

FLOWER. A short shoot consisting of an axis bearing one, but usually both, of the essential organs of reproduction, the stamens (male) and the carpels (female); but in most cases there is also a perianth consisting of an outer whorl of green leaves, the calyx, and an inner whorl of coloured leaves (the corolla), the leaves of each being either free or more or less united.

FLOWER-HEAD, HEAD. An inflorescence consisting of a dense cluster of sessile or nearly sessile florets sitting on a very short axis or receptacle.

FOLIOLATE. Having separate leaflets—*e.g.*, 3-foliolate means having three leaflets.

FOLLICLE. A fruit consisting of one inflated carpel which splits open at a definite line (the suture) when the seeds are ripe.

GENUS. A group of species more or less closely allied to one another.

GLABROUS. Entirely without hairs of any kind.

FRUIT. The seed-vessel with its ripe contents and any external appendages.

GLAND. Any secreting structure, whether raised or depressed; usually quite small.

GLANDULAR. Possessing glands.

GLAUCOUS. Bluish- or whitish-green.

GLOBOSE. Spherical or nearly so.

GLOMERULE. A compact and somewhat capitate cluster of flowers or fruits.

HERMAPHRODITE. Having both sexes in the one flower.

HISPID. Covered with stiff hairs.

HOARY. Greyish-white with a fine down or pubescence.

HYBRID. A cross between any two or more different true-breeding (producing their like) groups of individuals.

IMBRICATE, IMBRICATED. Overlapping like tiles on a roof; but the term is used very loosely, so-called "imbricating leaves" frequently not touching in any part.

INCISED. Sharply cut.

INDEHISCENT. Not opening by valves or otherwise; applied to fruits.

INFLORESCENCE. The flowering part of a plant, and especially the manner in which the flowers are arranged on the floral axis.

INSERTED. Growing upon.

INTERNODE. That part of the stem between two successive nodes.

INVOLUCRE. A ring of bracts surrounding a flower or a flower-cluster—*e.g.*, the flower-heads of the *Compositae*.

IRREGULAR. Not symmetrical.

JUVENILE. Applied to that stage in the development of a tree which comes immediately after the seedling.

KEEL. A prominent dorsal ridge; also the cohering anterior petals of a pea-like flower.

LAMINA. The blade of a leaf.

LANCEOLATE. Considerably longer than broad, and tapering upwards from the middle or below.

LATERAL. Belonging to or borne on the side.

LIGULE. A strap-shaped organ, as in the ray-florets of the *Compositae*; also a short, thin, scarious appendage at the junction of the leaf-blade with the sheath in grasses.

LINEAR. Very narrow and long, with the sides parallel till near the apex.

LIP. Either of the divisions of the corolla in the *Labiatae*.

LOBE. Any segment of a leaf, corolla, &c., especially if rounded.

MALE. A plant with only staminate flowers; or a staminate flower.

MEMBRANOUS. Thin, soft, and more or less translucent; but an unsatisfactory term.

MIDRIB. The large vein extending along the middle of a leaf from its petiole to its apex or nearly so.

MONŒCIOUS. Having the two sexes in separate flowers on the same individual.
NERVE. A simple or unbranched vein, or slender rib.
NODE. A point in a stem where a leaf is given off.
NUT. A hard or bony 1-celled indehiscent fruit.
OBCORDATE. Inversely heart-shaped, the notch being uppermost.
OBLANCEOLATE. Inversely lanceolate.
OBLONG. Considerably longer than broad, with parallel sides, usually slightly curved, and rounded ends.
OBOVATE. Inversely ovate.
OBOVOID. A solid with an obovate outline.
OBTUSE. Blunt or rounded at the end.
OVARY. That part of the pistil containing the ovules.
OVULE. The young seed within the ovary.
PANICLE. A branched raceme or corymb.
PANICULATE, PANICLED. After the manner of a panicle; bearing a panicle.
PAPPUS. The hairs, bristles, or scales forming a crown at the top of the achene in the *Compositae*.
PEDICEL. The stalk supporting a single flower in a compound inflorescence.
PEDICELLATE. Borne on a pedicel.
PEDUNCLE. A primary flower-stalk supporting either a single flower or cluster of flowers.
PEDUNCULATE. Furnished with a peduncle.
PELTATE. Flat and attached to its support at a point not on its margin but usually near its centre.
PENDULOUS. Hanging downwards.
PERIANTH. The floral envelopes, either the calyx or corolla, or both, but generally used when only one is present or the two are not to be distinguished.
PERICARP. The seed-vessel (matured ovary), including the adhering calyx, if present.
PERSISTENT. Long-continuous—*e.g.*, a calyx attached to the fruit; evergreen leaves; a juvenile form remaining unchanged for several, perhaps many, years.
PETAL. One of the leaves of the corolla.
PETIOLATE. Having a petiole.
PETIOLE. The stalk of a leaf. "Short-petioled," "long-petioled," express roughly the relative length of the petiole.
PILOSE. Having rather long, soft hairs.
PINNA. One of the primary divisions of a pinnate leaf.
PINNATE. A compound leaf with the leaflets arranged on opposite sides of a common stalk (rhachis). A leaf is 2- or 3-pinnate when its primary or secondary divisions are pinnate respectively.
PINNATELY. In a pinnate manner.
PINNATIFID. Deeply cut into segments nearly to the midrib.
PISTIL. The ovary, style, and stigma taken together.
PISTILLATE. A flower having only a pistil, consequently female.
PLANO-CONVEX. Flat on one side and convex on the other.
POD. A 1-celled, 2-valved seed-vessel with the seeds arranged along the inner angle; used also for any dry and dehiscent fruit.
POLLEN. The dust-like contents of the anther.
POLLINATION. The placing of pollen upon the stigmatic surface of the pistil, which, in large part, is carried out by wind, insects, and, for some species, birds.

POLYGAMOUS. With both perfect and unisexual flowers on the same individual.

POLYMORPHIC, POLYMORPHOUS. Consisting of many forms; also used by the authors to replace the term "variable" as applied to species.

PROSTRATE. Flat on the ground.

PUBESCENCE. A close covering of short soft hairs or down.

PUBESCENT. Covered closely with short soft hairs or down.

PUNGENT. Terminating in a short stiff point.

RACEME. An inflorescence consisting of a main axis (rhachis) from which stalked flowers are given off, the lowest opening first.

RACEMOSE. Like a raceme; bearing racemes.

REVERSION-SHOOTS Shoots of the juvenile-form put forth on an adult plant.

RHACHIS, RACHIS. The central stem (axis) of some kinds of inflorescence.

RAY. The branch of an umbel; the marginal florets of a flower-head in the *Compositae*, when distinct from those of the disc (disc-florets) or centre.

RECEPTACLE. The dilated top of the stalk bearing the flowers in the *Compositae*; the common support of the parts of a flower.

RHOMBOID. Quadrangular with the sides oblique.

RIB. A primary or prominent nerve or vein.

SCABERULOUS. Somewhat rough.

SCABROUS. Rough to the touch.

SCALE. A minute rudimentary leaf; a depauperated leaf; a small, flat, semi-detached part of the cuticle.

SEED. The mature ovule, consisting of the embryo (the rudimentary plant) and its coverings.

SEPAL. Each of the divisions of the calyx.

SERRATE. Toothed like a saw and pointing towards the apex of the leaf.

SERRULATE. Minutely serrate.

SESSILE. Without a stalk.

SIMPLE. Not compound; not branched.

SINUATE. Having a strongly waved margin.

SOLITARY. Growing singly.

SPATHULATE. Oblong with the lower end much drawn out.

SPECIES. A true-breeding group of individuals not closely related to any other such group (simple species); or two or more closely-related true-breeding groups taken together (compound species).

SPICATE. Like a spike, or arranged in a spike.

SPIKE. An inflorescence with sessile flowers on a long simple axis.

SPINULOSE. With small or frequently minute spines or prickles.

STAMEN. The male organ of a flower, usually formed of a filament and anther.

STELLATE. Radiating from a centre like a star.

STEM. The main ascending axis of a plant.

STIGMA. That part of the top of a carpel or style to which the pollen adheres.

STIGMATIC. Relating to or belonging to the stigma.

STIPULE. A leaf-like appendage at the base of a petiole. Leaves may thus be stipulate and exstipulate (without stipules).

STYLE. The part, usually attenuated, of the pistil between the ovary and stigma, but frequently quite short or wanting.

SUBULATE. Tapering from the base to a fine point.

SUTURE. A line of dehiscence in a fruit.
SYNONYM (abbreviated "syn."). A name superseded by another and not to be used. In this book synonyms only are cited which are still in frequent use—*e.g.*, *Sophora* for *Edwardsia*, *Fusanus* for *Mida*.
TEETH. Small indentations, sharp or blunt, on the margins of leaves.
TERETE. Nearly round in transverse section.
TERMINAL. Relating to or forming the end, or growing at the end.
TETRAGONAL. Having four angles.
TOMENTOSE. Densely covered with matted wool or entangled hairs.
TOMENTUM. A dense mat of entangled hairs or wool.
TORULOSE. Alternately swollen and depressed like a knotted cord.
TRICHOTOMOUS. In forks of three prongs.
TRIGONOUS. Having three prominent longitudinal angles, triangular in transverse section.
TRIQUETROUS. Having three angles and three concave faces.
TRUNCATE. Blunt, as if cut off at the end.
TUBE. The pipe formed by the cohesion of the parts of a floral whorl—*e.g.*, corolla-tube, calyx-tube. The parts not cohering are called the limb.
TURBINATE. Top-shaped; like an inverted cone.
UMBEL. An inflorescence in which several pedicles of about the same length radiate from the top of a common receptacle; it is simple when each ray is terminated by a flower, and compound when each ray bears a secondary umbel
UNISEXUAL. Of one sex; applied to flowers having stamens (male) or pistils (female) only.
URCEOLATE. Contracted at the mouth like an urn or pitcher.
UTRICLE. A small bladder-like, one-seeded fruit.
VALVE. One of the pieces into which a capsule or other dehiscent fruit splits.
VEIN. One of the branches of the woody portion of leaves.
VENATION. The manner in which the veins of leaves are arranged.
WHORL. An arrangement of similar organs in a circle round an axis
WINGED. Having a membranous or leaf-like expansion.

(*b*) ECOLOGICAL.

BOG. A plant-community growing on a wet, sour soil, usually with more or less sphagnum moss as one of its members; or the ground occupied by a bog community.
BROAD-LEAVED TREE. A tree with its leaves exceeding narrow-linear in breadth, but in general with leaves far broader.
BUTTRESSES. Expansions at the base of tree-trunks, sometimes plank-like, and extending over the ground to some distance.
COLONY. A more or less pure group of one or more species in an association, not being dominants—*e.g.*, a tree-fern colony in forest.
COMMUNITY. A unit of vegetation of undetermined status (associational, &c.).
COMPOSITION. As used of forests the term refers to the species present in the community discussed, and their relative abundance and status.
DICOTYLOUS TREE. A tree belonging to that division of the seed-plants which as seedlings possess two cotyledous (seed-leaves), as opposed to narrow-leaved and scale-leaved conifers.

DIVARICATING FORM. A life-form of shrubs or juvenile trees in which the twigs are greatly interlaced and usually stiff and wiry—*e.g.*, many species of *Coprosma*, juvenile *Elaeocarpus Hookerianus*.

DOMINANT. The species or life-form that determines the physiognomy of a community, but not of necessity that which is the commonest.

ECOLOGICAL. From the standpoint of ecology.

ECOLOGY. The study of the life-phenomena of the individual as it grows wild (autecology) or the community (synecology) in its natural surroundings. Both plants and animals are included under this term, but limited to either there is plant-ecology and animal-ecology.

EPHARMONIC. Due to modification in life-form from that usual to the species brought about by change in environment. An epharmone is a plant so modified, and epharmony a name for the phenomenon.

EPIPHYTE. A plant whose growing-place has for its substratum some portion of another plant, but which is not organically connected with it.

FILMY-FERN. A member of the genus *Hymenophyllum* or *Trichomanes*. The fronds (leaves) of these species are for the most part of very thin, filmy texture.

FOREST. A plant-community dominated by trees which are associated with many other life-forms. The term is not to be applied to very small tree-communities.

GROWING-PLACE. The immediate environment of the whole plant, the factors of which influence its life-history.

HABIT. The general appearance and structure of a plant—whether tree, shrub, or herb; erect, prostrate, or climbing, &c.

HABITAT. The environment of a plant-community taken in its widest sense—*e.g.*, soil, climate, its plant and animal content, &c.

LIANE. A climbing-plant. The term is sometimes restricted to woody climbers.

LICHEN. A plant form produced by the combination of a fungus and an alga, growing in mutual dependence. The life-form may be shrubby, leaf-like, crustaceous, or powdery.

LIGHT-DEMANDING. Requiring a considerable degree of illumination for full growth.

LIFE-FORM. The form of a plant which is in harmony with the conditions under which it lives. Life-forms fall into large groups—*e.g.*, trees, shrubs, herbaceous plants, &c.; and these into smaller groups, and so on.

PHYSIOGNOMIC. Giving a special appearance to the community or the plant.

PHYSIOGNOMY. The general appearance or habit of a plant, or of a community.

PLANT-ASSOCIATION, ASSOCIATION. A portion of a plant-formation distinguished by a definite floristic composition.

PLANT-FORMATION, FORMATION. An assemblage of plants of definite life-forms, one form or many being represented.

PLASTICITY. The capability of a plant being altered in its form, or that of its organs, or in its physiological behaviour, by a change of the conditions—external and internal—under which it is living.

SEMI-SWAMP. A habitat where the soil is not entirely covered by shallow water, but extremely wet and with pools here and there.

SHADE-TOLERATING. Able to grow well when exposed to a fair amount of shade.

STRUCTURE. The spacial arrangement, both horizontally and vertically, of the life-forms making up a community, together with their nature, variety, and relative abundance.

SUCCESSION. The process by which one community changes into another—*e.g.*, the succession from herb swamp to swamp forest. The term is also applied to the arrangement of a community in the primary, intermediate, and final stages.

SWAMP. A habitat where the soil is always covered with shallow water; or the community occupying such a station.

TREE. A perennial plant more than 10 ft. high having a distinct woody trunk from which branches more or less thick are given off, or with a crown of branches, tufted leaves, or leaf-rosettes at its extremity,

TUFT-TREE. A tree with a naked trunk and the leaves or abbreviated branches forming a bunch, or rosette, at the apex—*e.g.*, the cabbage-tree, tree-ferns.

TUSSOCK-GRASSLAND. A community dominated by tussock-grasses.

VEGETATION. The plant-covering of an area from the standpoint of the nature and distribution of the communities present, often incorrectly designated "the flora." The term *flora*, however, means all the species, taken together, of any area, or a book describing such. Flora is a noun in the singular number which takes the definite or indefinite article before it, and it should never be used as a plural noun—an extremely common error—as meaning plants or parts of plants.

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